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A Sane Inland Waterway Policy

**Tangible Progress is Being Made Toward the Actual
Utilization of Our Inland Rivers—Pork Barrels Empty**

IN addition to its manifold activities connected with building a bridge of boats to France, the Emergency Fleet corporation is expending some of its energy on the problem of improving and utilizing our inland waterways. Already some tangible progress is in evidence. An appropriation of \$3,360,000 has been made for the construction of barges and towboats for service on our inland rivers and bids were opened at the United States engineer office in St. Louis, on April 16, for the first fleet of 24 steel barges for service on the upper Mississippi river.

Knockers May Take the Elevator

It is both encouraging and refreshing to find the Fleet corporation proceeding along such sane and sensible lines in the development of our internal waterway commerce. It is evident that at last we have created a governmental agency which is capable of actually making use of our rivers, canals, etc.

The inland waterways of the United States are a priceless heritage which should be developed and utilized in the sane, reasonable and businesslike manner. For the first time such development seems in prospect. In addition to the activities of the shipping board and the Fleet corporation just mentioned, the railroad administration is tackling the problem of coupling the waterways up to the rail carriers. An exceedingly able committee including such practical ship operators as G. A. Tomlinson of Duluth, has been appointed to investigate the whole subject. It is to be expected that the recommendations of these gentlemen will be entirely trustworthy and constructive. They propose to go into the subject exhaustively and to base their conclusions on the findings of

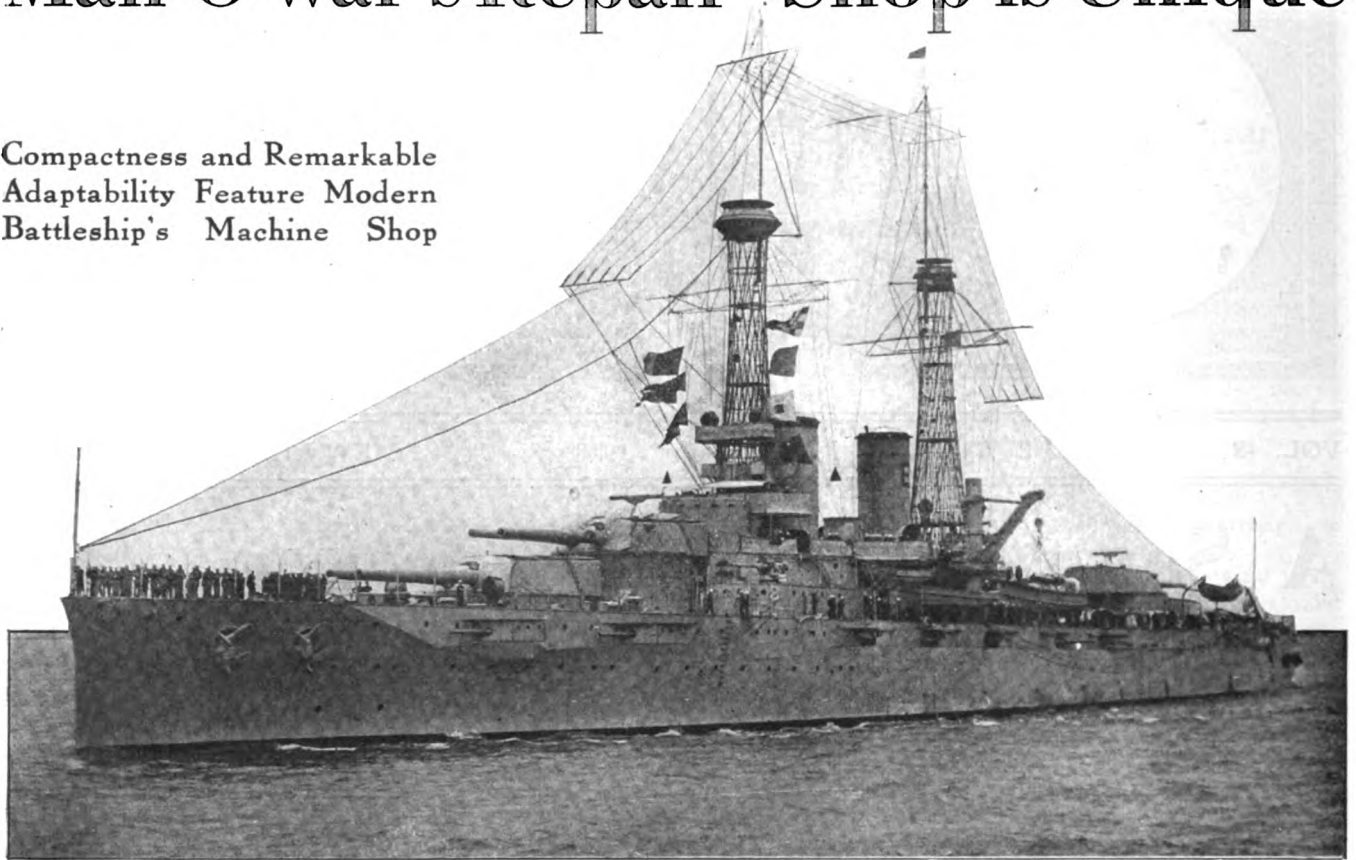
business men familiar with the traffic problems of the country. This commission realizes that waterway development is doomed at the start unless a comprehensive and effective system is worked out for interchanging freight with the railroads. This is a cardinal point that a great many waterway enthusiasts have overlooked in the past. No matter how highly they are developed, waterways cannot stand alone. They must be operated as an integral part of our general transportation system, and since the great bulk of the tonnage originates at points inaccessible to waterways and is consigned to similar points, a system of co-ordinating the work of the railways and waterways is absolutely essential to success.

The Familiar Odor of Pork

There appears to be only one phase of the waterway situation that is unsatisfactory at present. The river communities which will be most benefited by waterway development do not seem to yet have awakened to the new spirit of the times and to the necessity for approaching the problem from a broad-minded, businesslike standpoint. Many river towns are still redolent with the odor of pork. There is more talk about appropriations than traffic; and more effort to get a wing dam built 2 miles south of town than to look freight handling problems square in the eye. The graft is not entirely national. A considerable portion of it is local. Enthusiastic town councils are appropriating money for warehouses, docks, etc., far beyond the needs of the present generation. The river towns should wake up to the fact that the waterway problem has assumed supreme national importance. It has grown too big to remain the football of cheap politicians.

Man-O-War's Repair Shop is Unique

Compactness and Remarkable
Adaptability Feature Modern
Battleship's Machine Shop



Photographs by Underwood & Underwood

AN ESSENTIAL feature of modern naval design is the provision of adequate facilities for making the repairs which are constantly necessary aboard so complicated a piece of mechanism as a battleship. Although a machine shop aboard one of Uncle Sam's capital sea fighters comprises only a few essential tools and is intended mainly for minor repair work, its range of usefulness is surprising. Indeed, it is a really serious emergency, such as the fracture of a propeller shaft, or failure of the intermediate or low pressure rings of the main engine, which cannot be remedied aboard ship immediately without reference to a navy yard. Supplementing the machine shop, are a brass and aluminum foundry, and coppersmith, blacksmith and tinsmith shops.

Although in laying out these departments it was borne in mind that space aboard a battleship is at a premium, there is plenty of room to handle all work which is likely to come within their scope. Such work includes the casting and machining of valve castings, eccentric straps, pump liners, flanges, the cutting of gears, the re-babbiting and boring of crank bearings for the main engine, the making of small hand forgings, the forming and riveting or brazing of tanks and pipe and many other operations.

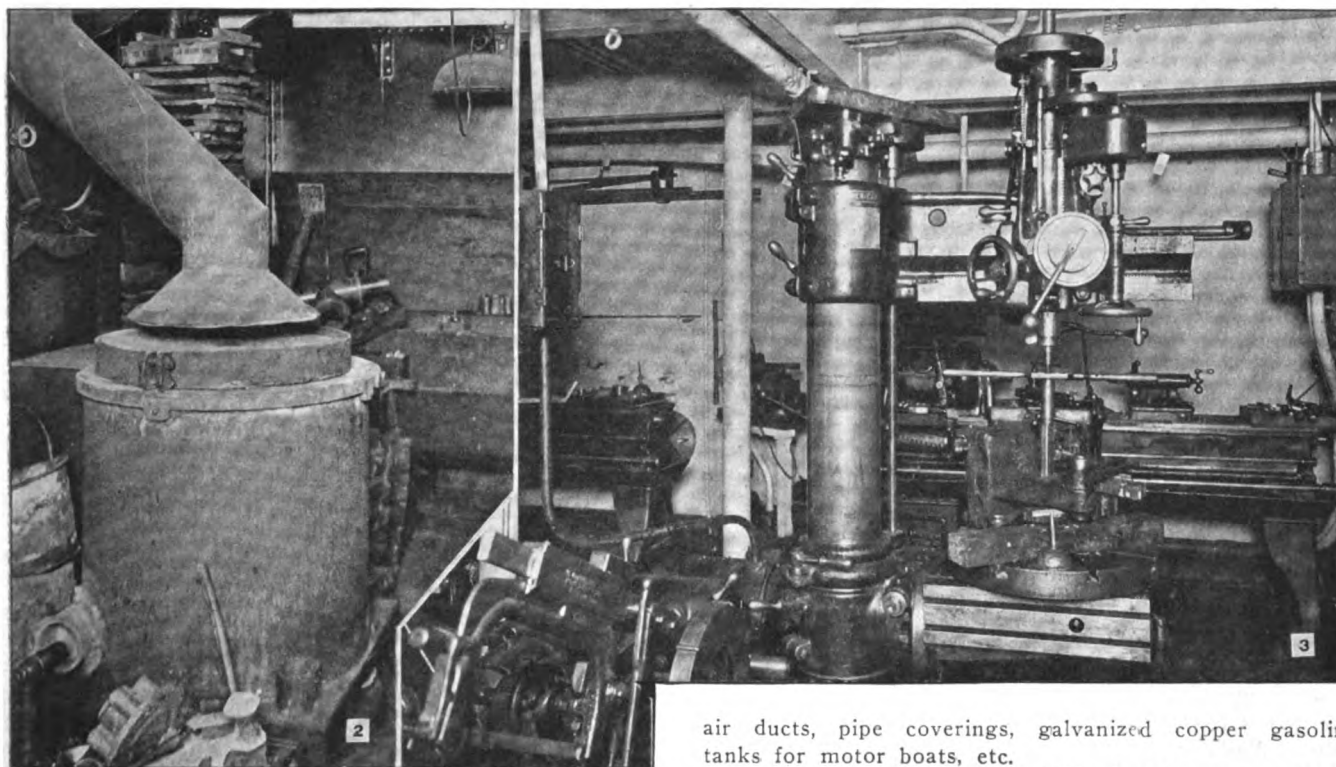
Fig. 4 shows the principal unit in the machine shop, a 24-inch engine lathe, 10 feet between centers, engaged in turning a 10-inch piston ring for the main circulating engine.



The lathe has a 3-foot gap permitting a swing of 48 inches. It is used principally for turning high-pressure follower rings, piston rings and eccentric straps for the main engine and for turning and boring pump liners.

Fig. 3 shows a corner of the machine shop with a 12-inch radial drill in the foreground. This machine is direct-driven by a 3-horsepower motor and is provided with a rotary table in order that the work may be set at any desired angle to the tool. Used for the boring of pump cylinder connections and for general drilling and boring operations, the machine as shown in the illustration is engaged in reaming a bushing in the valve gear arm of a fire and bilge pump. Other machines shown in this illustration are a 14-inch swing lathe, 48 inches between centers, direct driven by a 2-horsepower motor; a 14 x 60-inch tool lathe and a hacksaw direct-driven by a 1-horsepower motor.

Fig. 5 shows a No. 2 universal milling machine which is belt-driven by a 2-horsepower reversible motor. This machine is used for a large variety of purposes, including the cutting of gears, the machining of gear cutters, keyway cutters and special milling tools. It is provided with a complete assortment of keyway cutters, metal slitting saws and cutters for making drills, reamers, taps and other tools. As shown in the illustration, it is engaged in cutting a keyway in the valve arm of a fire and bilge pump. Additional tools in the machine shop in-

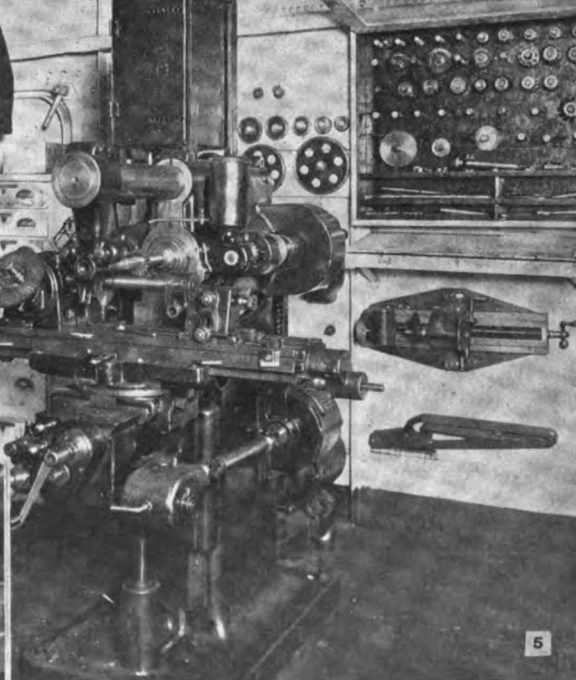
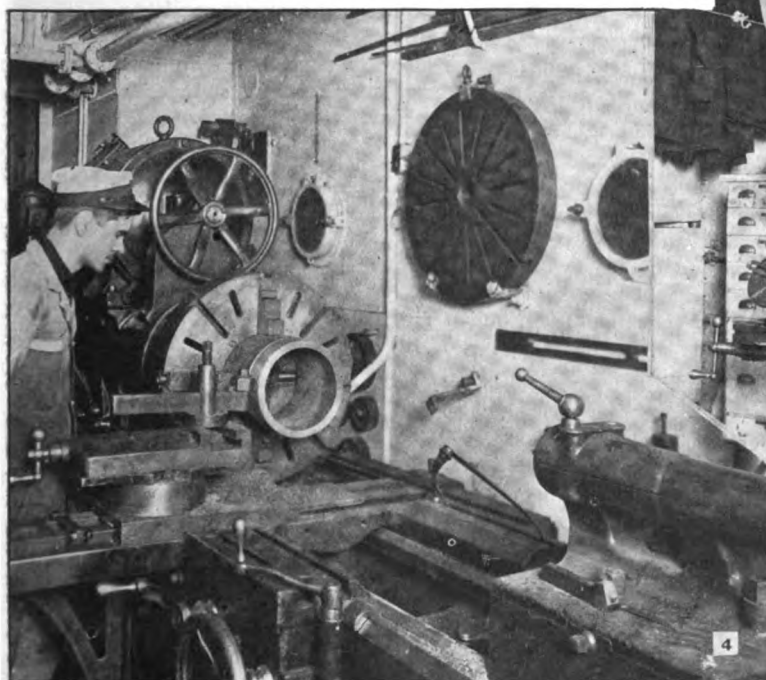
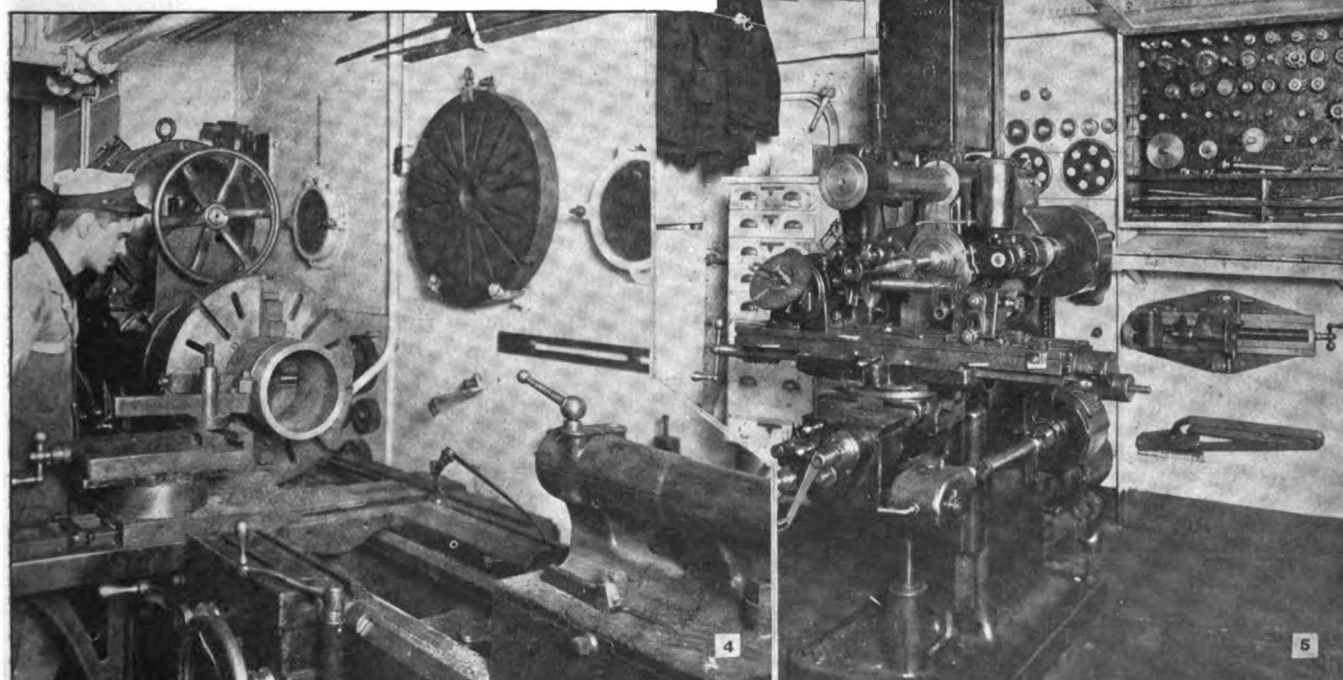


clude a 16-inch stroke shaper, which is used for planing valve seats and various other operations, including all kinds of small work; a sensitive drill for high-speed drilling; an emery grinder with surface grinder attachment for grinding castings and tools; a portable, electric-driven boring bar for boring out the main engine valve chest and high-pressure cylinder; threading machines with capacity for pipe up to 6 inches in diameter, and work benches and hand vises.

Fig. 1 shows the brazing of flanges on a copper pipe which is to be used in the battleship heating system. The coppersmith shop is provided with a portable coppersmith forge and blower which are employed for all kinds of brazing, patching, pipe bending, rebabbiting of bearings, etc. Adjoining it is a small room equipped with bending rolls and a beading machine for making

air ducts, pipe coverings, galvanized copper gasoline tanks for motor boats, etc.

Fig. 2 shows the foundry. This department is equipped with an oil-burning crucible furnace, having capacity for 200 pounds per heat; and with a combination sand bin and coremaker's bench, and all necessary molding equipment. It is provided with a stock of ingot brass and aluminum which, in conjunction with the scrap constantly accumulating aboard the vessel through the rejection of worn-out parts, is sufficient for all castings requirements. The castings most frequently made are valve seats, valve disks and other valve parts, and various pipe connections, such as tees, wyes, etc. Adjoining the foundry is the blacksmith shop which is equipped with forge, electric blower and anvil for producing hand forgings. A complete stock of metalworking tools is provided.



The Rivetless Ship--A Possibility

How Electric Welding is Being Applied to Shipbuilding—Time and Labor Saved—Steel Conserved

WHEN Germany, prior to declaration of war by the United States last year, undertook to disqualify for American service the German vessels interned in this country, she committed an act which in the light of present developments may prove a veritable boomerang. It was in the repair of the damage done at time that a process, which long had been regarded with suspicion by marine engineers, was brought into use and thoroughly demonstrated. Just how the electric and oxyacetylene welding processes reclaimed these vessels in a relatively short time is now an old story, yet the performance carried with it possibilities which today are receiving serious consideration by the authorities at Washington.

Are Rivets Passe?

As a result, electric welding, instead of riveting, may play the dominant part in the construction of steel vessels. In other words, the steel plates of the hull will be welded instead of riveted together. Already the practical application of this process to the shipbuilding industry is being tested by the government at four yards, and the work so far is proving highly satisfactory. According to data obtainable up to date, the process will increase the strength of the joint at least 25 per cent and decrease the time it takes in getting out a hull nearly 50 per cent. Eminent marine engineers claim that there will be a saving in labor of 60 to 70 per cent.

The machine being employed on this work is the Wilson welder, which Commander E. P. Jessop, U. S. N., used so successfully last year in rehabilitating the German interned ships, as described and illustrated in detail in the February issue of THE MARINE REVIEW. At that time, it may be recalled, the machine performed its task in days when it was believed months would be required, and at a cost of thousands where millions had been the estimate. It was developed on the Erie railroad by David H. Wilson, a consulting engineer of New York, who now is devoting his time almost entirely to the service of the government.

In commenting to THE MARINE REVIEW upon the tests now being made by the government, Mr. Wilson said:

"At present we are using the plates now on hand and are welding what we call a lap joint; that is, we overlap the

plates at least 2 inches, and oftentimes more, and weld down each edge. These plates are previously put through a double shear. After we get a little further along and use up the plates we have, we will start in on butt welding. This will be undertaken in the very near future.

"The plates used for this work will be beveled, so that upon being placed edge to edge, they will form a V-shaped

Welded Ships

THROUGH the stress of war, many time-honored shipbuilding methods have been cast into the discard. The spirit of achievement is abroad in the land, and from one of the most conservative, shipbuilding seems destined soon to emerge as one of the most progressive of the mechanical enterprises. Today we have standardized ships, fabricated ships and concrete ships. Tomorrow may see welded ships, cast steel ships and other new wonders. The rivetless cargo carrier is not beyond the range of possibility. Electric welding is now being extensively employed in eastern shipyards with marked savings in time and labor—vital elements in these win-the-war days. The accompanying article, based on interviews with leading welding engineers, covers this important new subject thoroughly.

groove. Into this groove the welding metal will flow and harden, leaving a welt over the top of the V, but at the same time leaving the reverse side, the one which will be exposed to the sea, perfectly smooth. Thus, with the outside of the hull virtually like one piece of glass, the friction caused by the vessel while in motion will be considerably reduced, and, consequently, fewer demands will be made upon engine power.

Steel Will be Saved

"By this method of placing the plates considerable steel will be saved, which otherwise is wasted by overlapping, and at the same time the weight of the ship will be reduced. We have welded plates $3\frac{1}{2}$ inches in thickness and these have been the largest we have had to handle on any job. There is considerable talk now of casting entire steel

sections of ships and then welding these sections together; however, this may not be expected for some little time.

"While electric welding will eliminate the use of rivets to a large extent, the process will not eliminate them entirely, at least at the start. There will be a certain amount of riveting required, such as is needed, for instance, in attaching the plates to the frames, etc. I think even this work, though, will eventually be done away with.

"That electric welding already has its particular application to the shipping industry was very ably demonstrated by Commander Jessop last year. It was shown at that time that repair work could be done without removing the broken parts from the ship. When a vessel comes into port with a broken cylinder, the damage is repaired right on board. No preheating is necessary; no annealing is necessary, and it makes little difference how bad the break is. Thus, the ships are easily kept in continual operation, and at the same time are kept in good repair.

Women Are Employed

"As to the possibilities of electric welding in the actual construction of ships, they are practically unlimited. Leading naval and marine engineers are of the opinion that it will aid in the solution of our war shipping problem, and that, of course, the item of greatest importance at this time. It will accelerate speed of production by lessening the demands on labor. This applies to labor as a whole and to skilled labor in particular. For this work, we can take a novice and develop him into a satisfactory operator in 30 days, and on what data there is now available, it is estimated that 30 welders can do the work of 125 riveters. Today several of the railroads have started to employ women for this work in their shops, and so far they are proving superior to the men."

The principle of the process of electric welding now employed by the government found its origin in Russia. Germany later took it up and, in fact, was the first country to place the system on a commercial basis. However, prior to the outbreak of the war in 1914, little had been done in that country in its development, although later when the supersubmersible U-53 visited this country, about a year and a half ago, it was seen that her hull was electrically welded, indicating a vast im-

provement in the process now used by Germany as compared with that employed before the war. It is believed, however, in this connection, that much of her progress along this line has been due her disregard of American patents and adoption of American methods.

In this country, up until the time the railroads took up the process, 8 or 10 years ago, little had been done in the way of satisfactory welding. With the machines which existed up to that time, it was impossible to get a constant heat, and in the welding cast iron or even steel, this is absolutely necessary. A weld of 60 per cent efficiency was the best that could be done, and then no absolute dependence could be

placed on the work. The machines would burn the metal one minute and would not give enough heat the next. Finally, Mr. Wilson, as consulting engineer for the Erie railroad, developed a machine by which the heat could be controlled, thus doing away with possibility of burning the metal.

Arc Principle is Employed

With the advent of this apparatus, the application of the welding process to the railroad industry developed appreciably. The adoption of electric welding by foundries generally throughout the country is becoming widespread.

The Wilson machine is operated on what is known as the arc principle. It

consists of a motor-generator set with a high-voltage motor, which will run on any commercial current, coupled with a dynamo wired for 35 volts. This supplies the welding current, which passes through a panel equipped with current regulating apparatus, switches, etc. To the panel are attached the cables leading to the welding iron. This iron carries the welding metal which in the process acts as one electrode, while the ship plate forms the second electrode. The heat, which is constant, is just sufficient to fuse the welding material and the steel to be welded. The welding metal is high in manganese which insures the proper tensile strength and other qualities. No flux is used.

Converting Sailing Vessels to Motorships

IN THE conversion of sailing vessels into motorships, which now is going forward on a steadily increasing scale, is seen a development of considerable importance and timeliness. It serves to provide cargo carrying capacity that otherwise would be unavailable, which is equivalent to the construction of new tonnage without making any special demands on time and labor. And in this latter phase, the movement is particularly noteworthy. The construction of a new auxiliary schooner involves a matter of months, when days and even hours are vital to the nation's success in getting men and supplies across to the other side.

While much has been done already in the conversion of existing sailing vessels into auxiliary schooners, this work still may be regarded as being only fairly begun. The extent to which the freight carrying capacity of American sailing vessels can be increased by this means is being amply demonstrated by the converted sailing vessels now in operation. The logs of those ships which have been equipped with motors or auxiliary engines show that at least three trips can be made under power as against two when depending solely upon the wind. In other words, after deducting a loss of cargo space of 10 per cent by installation of motive power, a sailing vessel's carrying capacity is increased 40 per cent. If this ratio were to be applied to the total sailing vessel tonnage of the coun-

try, now estimated at more than 1,600,000 tons, the increase would be 520,000 tons. This capacity, while small in comparison with what is needed at this time, represents a tonnage equal to that of approximately 140 auxiliary schooners such as now are being built at many yards. This may be regarded as a liberal estimate, which allows for the greater speed which may be expected from the new boats.

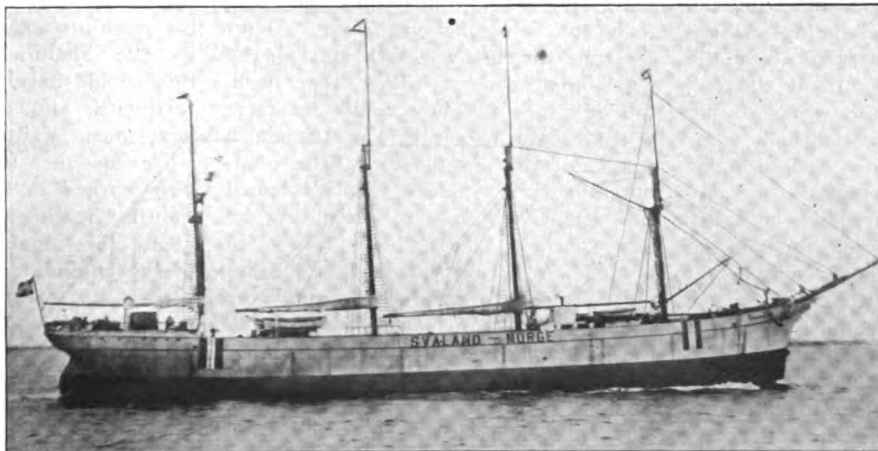
In considering this question from the standpoint of time, some equally interesting figures are brought to light. Under highly favorable conditions, a 3500-ton auxiliary schooner can be constructed in four months. Under equally favorable conditions, a schooner of similar capacity can be equipped with motor power in one month. By applying this difference of three months to the ships now afloat, the vast amount of time and labor saved can be readily appreciated.

There have been objections made on the assumption that the older vessels would not stand the vibration of motors, but the basis for these objections have been disproved by experience.

Among sailing vessels which recently have been converted into auxiliary schooners, is the 4000-ton SVALAND, which is operated between this country and South America by S. O. Stray & Co., New York City. This vessel, which is shown in the accompanying illustration, is equipped with two 320 brake horsepower 4-cylinder Bolinder engines, 225 revolutions per minute, which gives her, when loaded, a speed of $7\frac{1}{2}$ knots. These engines, built by the Bolinder Co., 30 Church street, New York, run on heavy crude or residue fuel oil, and also on kerosene. The SVALAND is 300 feet long, 42 feet beam and 24 feet deep. Other vessels in which Bolinder engines recently have been installed include six schooners for the Standard Oil Co., four schooners for the Taylor Engineering Co., one dredge for the Bucyrus Co. and one schooner and two barks for the W. R. Grace & Co.

Commenting on a recently published report of the Nippon Yusen Kaisha, *Fairplay* says that compared with the Peninsular & Oriental Co., which was in existence 50 years before the Japanese concern was thought of, the English company has a capital and indebtedness three times that of the Oriental line, while the latter has reserves four times larger than the British company.

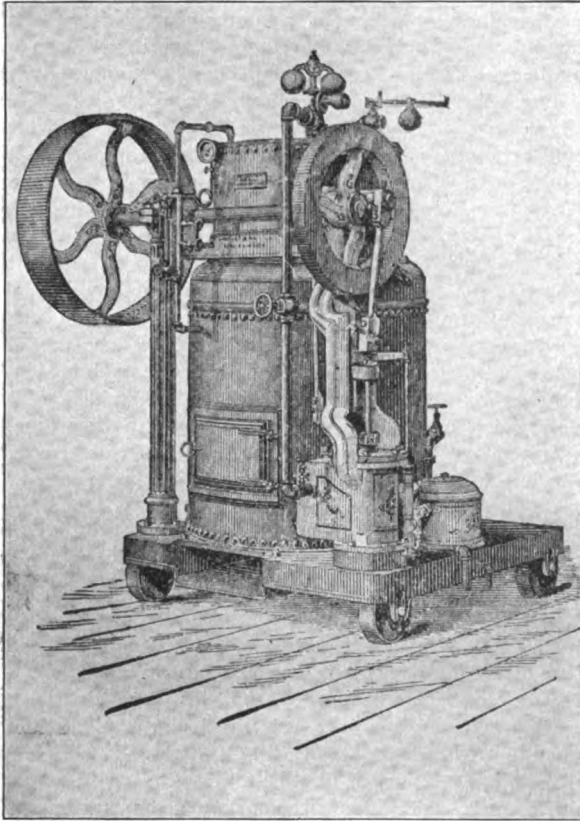
The Lone Star Shipbuilding Co., Beaumont, Tex., has secured the contract for equipping for sea 21 ships.



FOUR-MASTED SCHOONER SVALAND, CONVERTED FROM SAIL TO POWER BY INSTALLATION OF BOLINDER ENGINES

From a Lake Dredge to a Transatlantic Liner

True Story Of a Retired Marine Engineer



The Engineer's First Engine Which Ran the Coffee Grinder and Roaster in a Grocery Store, Where He Secured His First Job

At an early age a boy who was always interested in steam engines used to help operate the engine in a grocery store on Saturdays. This engine ran the coffee roaster and coffee grinder. He did this for a skilled engineer, James C. Decker, who owned the grocery store at that time and who told the boy many things about steam which were useful to him in after life. The little engine and boiler were probably of 2 horsepower and were of a variety totally extinct now.

The next summer vacation, the boy fired a railroad pumping-plant boiler for the whole summer under the direction of a baggage master, Harley Clark, who was the engineer of the pumping plant besides being a baggage master. The boy received the compensation of 10 cents at the end of the summer for the work he did in addition to what he learned.

Another vacation, he fired a boiler with sawdust and shavings in the basement of a feed store, and his only pay was the privilege of blowing the whistle and stopping the engine at night in addition to what he learned. The engineer wisely would not let him start the engine in the morning.

About this period, the boy's father, who was quite a well-to-do business man, failed in business and the boy went to work as a bobbin boy in a cotton mill, where he received 30

cents a day. After the boy had been there four or five weeks, one morning the engineer blew the cylinder cover from the engine, which was about 75 horsepower. The boy was then made engineer and the engineer was placed in the fire-room and told to stay there. This boiler incidentally was a well-known type of watertube boiler on the mar-

in another large lake port. He performed the duties of fireman at the then splendid salary of \$26 a month and board, such as it was. The boiler in the dredge was of the locomotive type; probably 50 or 60 horsepower, with a furnace door in the side of the fire box. Wood edgings were used for fuel, which meant almost constant firing and attention. The dredge dug mud 12 hours a day. This meant that the boy had to get up at 4:30 in the morning to get up steam in the boiler. Also he had to scrub out the engine room at night after the running of the dredge was over.

In the fall of this season, the dredge was ordered to be transferred to another lake port and it was driven ashore in a heavy gale in Lake Huron. Before the dredge went ashore, the men were actually in line with pails to keep it baled out. The dredge drove high and dry, as they used to say, on "the man's farm". When the weather cleared, the dredge was dragged off from the beach and proceeded under easy steam in tow of a tug. In passing, he wishes to comment on the judgment of Captain Corbin of the tug, who, instead of trying to come back and pick them up on account of the signals of distress that they were making, realized his position and towed them through to the shallow water. Otherwise, they would have gone to "Davy Jones" forthwith, and this story would not have been written.

During the following winter, the boy worked in the shipyard at \$10 a month heating rivets and helping about the repairing and overhauling of the engines and boilers of the tugboats and dredges which the company owned—some five or six of each. He worked with a skilled engineer, William Logan, whom the boy has been proud to have known ever since. This engineer spent considerable time in instilling into the boy sound and sensible mechanical principles.

ket today. The boiler was located in a dirty water district and the tubes had to be scraped out inside quite often. The boy used to go down and work the entire week-end with the men, holding a lamp and carrying drinking water to them for what he would learn about the business. So that by the age of 12 the boy was somewhat of an engineer. Later the boy's family moved to a then quite important lake port, and a then quite important lake port, and the boy got his first real job—running an engine of about 15 horsepower in a stone yard for the magnificent salary of \$5 a week. This boiler was fired with butts of logs from a shingle mill; logs which had to be split before put into the fire box. About the time the boy was well started, the man failed and, as times were hard, the only job the boy could get after a three-month search was to run a small portable engine in a little planing mill at \$5 a week—which seemed the set wages for boy engineers of that period. This boiler was so bulged and leaky around the staybolts in the furnace and around the wagon top that the boy, after working there a week decided that life was too precious to work longer around that boiler.

Next the boy was sent away from home, for the first time, to work on a dredge which was then stationed

How a Marine Engineer Made Good

TO stand before the handling gear of a massive marine engine that is sending a vessel through the water at a 20-knot clip has been the dream of thousands of youngsters. Now that the United States is assured of a merchant marine, opportunities for promotion are innumerable and hundreds of these youngsters may realize their dreams.

The call of the sea is strong in many boys and in this story a marine engineer who felt the call and worked his own way from a position of obscurity to one of national prominence, tells his life's story in his own words.

The narrative will appeal to the boys of today as it tells just what the author engineer had to go through to achieve success. Conditions have changed since this marine engineer began his career. Now a young man in beginning his climb to the top finds his path made easier as the government is willing to assist him and has already established reliable schools where young men can be trained for engine room officers.

This engineer's story is a true narrative of actual experiences. It will prove of interest both to veteran engineers and to the host of young men who wish to make marine engineering their life work.

The next summer the boy was promised a different dredge, as the one he was on was the poorest and most obsolete contraption then in existence. When the time came the manager insisted that the boy go in the same dredge so that "he would not learn too many trades" as he put it. This was, of course, a business man's decision. This summer the dredge operated in the Hay Lake channel in the Sault Ste. Marie river. Everything went along smoothly until the Fourth of July came, when the company provided a tug boat and an open scow to tow the men to Sault Ste. Marie for their Fourth of July celebration and to bring them back. The boy was given the position of firing the tugboat for the trip, which was quite an honor since he had fired only a dredge up to this time. But in those days he did not know how to handle coal and soon got the furnace badly clinkered so that steam went down and the engineer had to come down and help the boy out in the fire room.

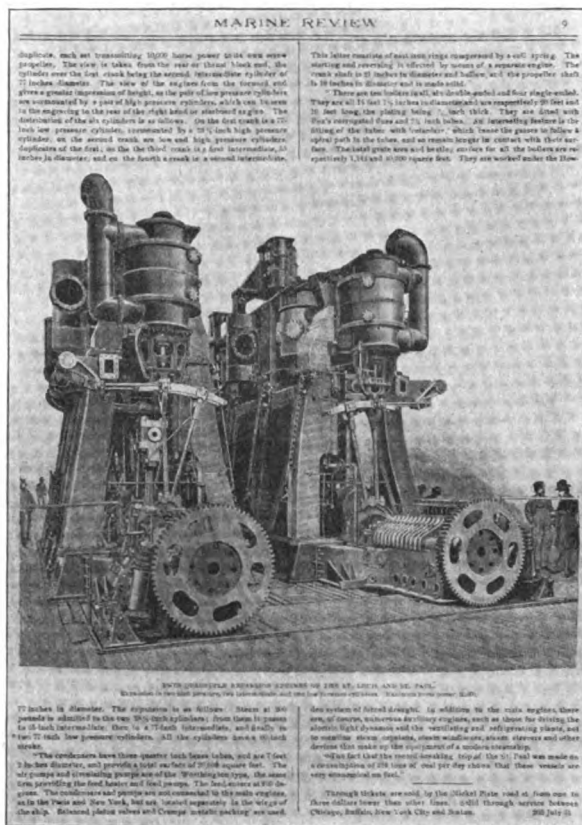
Works in Machine Shop

At the expiration of this season's work, which was the last season the boy fired dredges, through the efforts of his mother, he procured the then splendid chance to serve his apprenticeship to the machinist's trade in a general machine shop owned by Mitts & Merrill, employing probably 50 men. These men had to do all kinds of work including small steam engine work, the making of small propellers and their installation on tugboats. As the shop was

a small one, the boy had to do everything from "carrying off" in the foundry to running the lathes in the shop. Through his considerable marine experience, he had learned to keep his mouth shut when in the presence of superiors and was taken kindly to by the men.

Among them were some of the most skilled mechanics he has ever seen before or since—men who had to create boring mills for boring 25-foot pulleys with boring bars and a horse tramping around the pulley with a sweep as motive power, and men who turned their own shafting by the mile, and it was always true. They had to make all sorts of creative and distinctly American shop kinks, which were evolved for many emergencies. This shop also did a great amount of work for large saw mills.

After serving a full apprenticeship of 309 days at 10 hours a day actual labor, the boy procured a position with the Pere Marquette railroad. After seven weeks running what they called the oldest lathe and doing the most rudimentary work, he was promoted to the position of assistant toolmaker after having started in the most menial place in what was then one of the finest shops in the west; in fact there were about 300 men in the mechanical department. From serving his apprenticeship in a small country machine shop, he received a splendid early training as a mechanic. In these days machinists made their own twist drills, taps, dies, reamers and milling cutters, and it



Quadruple Expansion Engines of the St. Paul on which the Engineer was Chief. Reproduced from THE MARINE REVIEW, July 23, 1896

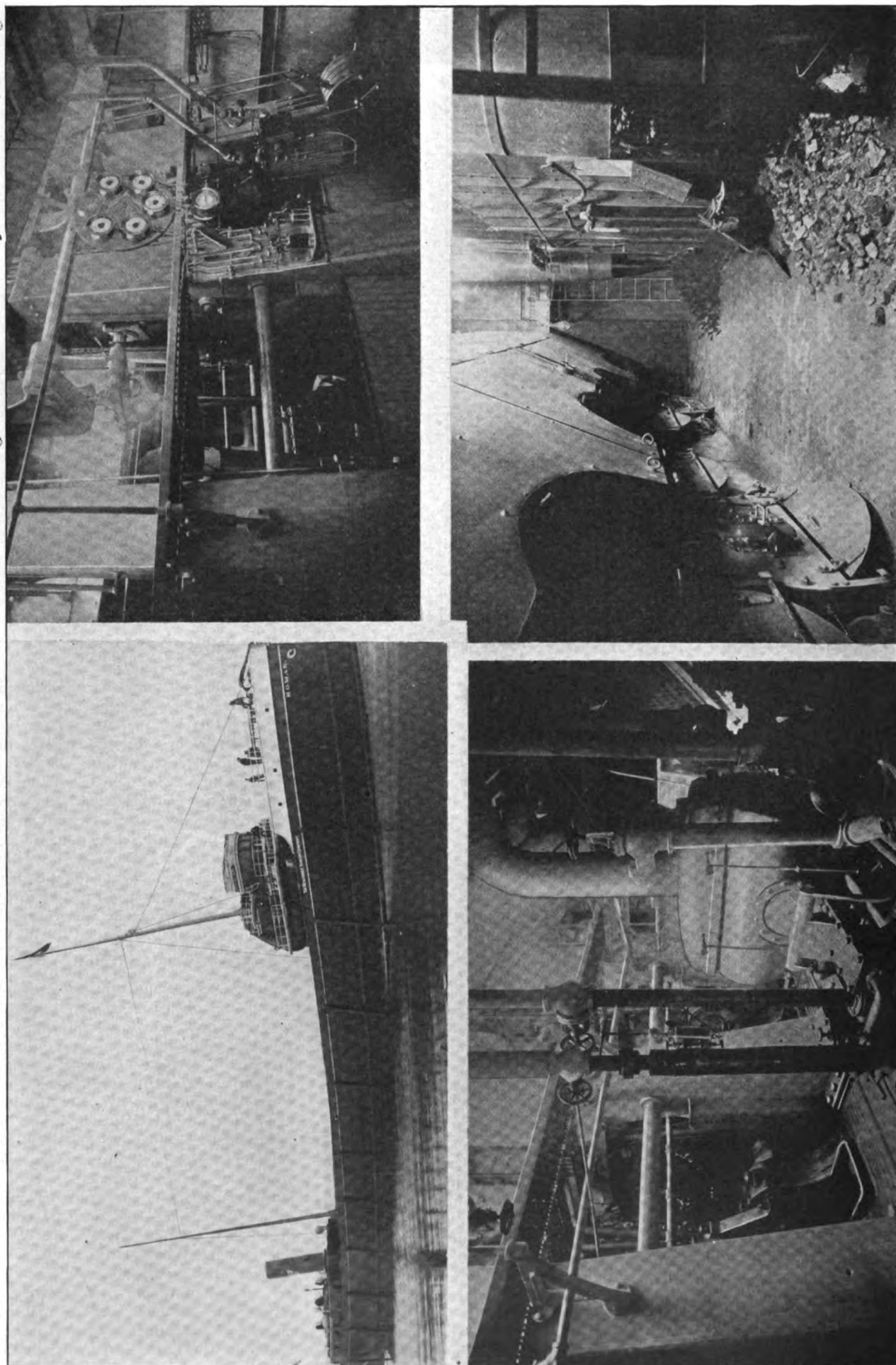
was considered some accomplishment.

After working in this shop about a year, the boy's mother conceived the idea that he must have more education in order to advance farther in engineering. Through most herculean efforts on her part, the boy after being away from school seven years, returned to school and, in due course, graduated from a first-class high school and went to the University of Michigan. By borrowing money at 6 per cent he was thus able to educate himself.

Secures Second Engineer's Berth

During vacations, the boy would go to Detroit or Cleveland a month before school was out, returning to school a month late and was able to procure a second engineer's berth part of a season on the Detroit river ferry boat SAPHO. He had obtained his license as assistant engineer on his twenty-first birthday, Sept. 16, 1889. Another season he was on the lake steamer BYRON WHITTAKER; part of a season he worked as second engineer of the famous old lake tug CHAMPION; at another time he was on the Ward line steamer WILLIAM H. STEVENS.

About this time, the boy did not get along with higher mathematics in college, such as conic sections and trigonometry, due principally to the hard, laborious work done in his early youth,



FOUR VIEWS OF THE ROMAN; A LAKE FREIGHTER ON WHICH THE ENGINEER SAILED. THE ROMAN AT SEA AND THE HANDLING GEAR IN THE ENGINE ROOM ARE SHOWN IN THE UPPER VIEWS WHILE THE LOWER ILLUSTRATIONS SHOW THE ENGINE ROOM AND FIRE HOLD

and he decided at that time that he would rather be a first-class man in an engine room than a second-class man in a designing room. He, therefore, gave up his college work, procuring an indefinite leave of absence from the University of Michigan from the late president, James B. Angell. He went into the employ of the Menominee Transit Co. as second engineer of the steamer *ROMAN*, after working a short time in the engine departments of the shipyards of the Cleveland Shipbuilding Co. and also the Globe Iron Works, now combined in the American Shipbuilding Co.

The *ROMAN* was fitted with two Scotch boilers and triple-expansion engines, with cylinders 24, 38 and 61 inches in diameter and 42-inch stroke. A working pressure of 160 pounds was allowed. All auxiliaries, that is air and feed pumps, bilge pumps and sanitary pumps, were independently driven. This started his real career as a marine engineer, for, from that date on, he worked continuously on some of the largest steamers then in existence on fresh and salt water. He takes occasion at this time to mention the chief engineer of the steamer *ROMAN*, Samuel A. Wells, who at that time had 40 issues of licenses which meant that he had been an engineer for 40 years. He was of a type fast becoming extinct in those days.

Starts for the East

At the end of his first season, he decided that he wished to go to salt water and he went to New York, landing there Christmas morning. He went aboard some 20 different steamers that day, obtaining promises of three positions. As scarce as money was he offered \$5 to the engineer in charge of the watch of the White Star liner *TEUTONIC* for the privilege of going below and looking the engines over, but was not permitted to do so. He was, however, permitted to go below in one of the Cunarders, the old *AURANIA*.

That night, about 10 o'clock or thereabouts, his door at the rough hotel in which he lived, was loudly knocked upon and he was asked if he would substitute in a building in New York for an old gentleman, Thomas McDonough by name, a man who was at one time chief engineer of the Providence line running between Providence, R. I., and New York. Mr. McDonough wished the boy to substitute for him in a building in which was located the New York Daily News Co., a concern now out of existence. The boy stated that he came to New York to go to sea and naturally demurred at going into a stationary position, but when told that the job paid \$25 a week, a salary in those days unheard of in the west for a plant

of that size, the boy, of course, could not resist the temptation and took the job for the winter. The job consisted of running two small corliss engines, either of which would run the printing presses. They took their steam from a pipe in the street from the New York Steam Supply Co.

Comes West Again

After this winter, he again returned to Cleveland and went with his old chief engineer, Mr. Wells, for a second season on the steamer *ROMAN*. About the middle of this season, all of the steamers, due to the panic at that time, 1893, were laid up, with the exception of the *CAMBRIA* and two other older ships. On account of being the oldest first assistant in the line, the boy was transferred to the *CAMBRIA* which had the first triple-expansion marine engine built on the Great Lakes. This was constructed from Scotch designs, purchased from a Clyde shipbuilding company.

After completing the season on the *CAMBRIA* with a strict taskmaster as chief engineer, Hiram N. Wadleigh, another old-timer, the boy went to the head offices in Cleveland to know what steamer he was going to have as chief engineer the next season. The superintending engineer, C. B. Calder, now vice president and general manager of the Toledo Shipbuilding Co., Toledo, O., told the boy that he did not know whether he was to have any steamer or not. The boy would mention that this was a distinct turning point in his life. This failure to receive a ship put more iron in his blood than he had previously had, and made him determined to prove himself an engineer before he got through. The following morning he left on the Empire State express for New York.

Upon arriving in New York, he went before the superintending engineer of the International Navigation Co., George Clark, and was catechised as to his early training. When telling of his experience, he mentioned that he had never done any salt water engineering. The reply was, "If you are an engineer it makes no difference whether you are a salt or fresh water engineer."

Ships on Deep Water

The boy has often believed since that he got a job on account of saying that if there were any fusible plugs to put in the boilers of any of the ships, if they would show him the boiler he would put them in. This seemed to impress Mr. Clark favorably.

The boy was turned to work in the Jersey City shops the next morning in the shore repair gang, and, after working about 10 days was given orders to proceed to Philadelphia to the *INDIANA*.

After making one voyage as third assistant engineer on the *INDIANA*, operating between Philadelphia and Liverpool, he was transferred and promoted to the *ILLINOIS*, operating between Philadelphia and Antwerp, as second assistant engineer. After making five voyages as second assistant engineer, he was made first assistant engineer of the *ILLINOIS*, which position he held for practically 13 months, working under an able engineer by the name of Edwin R. Throsby.

At about this time, and very opportunely, the boy requested of James S. Doran, chief superintending engineer of the International Navigation Co., a masterful engineer in his day, that he be placed on the big ships, to which Mr. Doran replied that, of course, he would have to take a small position. A short time afterward the boy received orders to proceed to New York to join the steamship *NEW YORK* of the American line, as fifth engineer at \$50 a month, thus leaving the steamship *ILLINOIS* and the position of first assistant at \$90 a month with three gold bands on his coat sleeve, to be fifth engineer of the *NEW YORK* at \$50 a month without any bands or any position of consequence. James Taylor was the chief engineer of this steamer. In the same way, the rising young men of today should once in a while be willing to sacrifice money for experience so that their attainments would be greater.

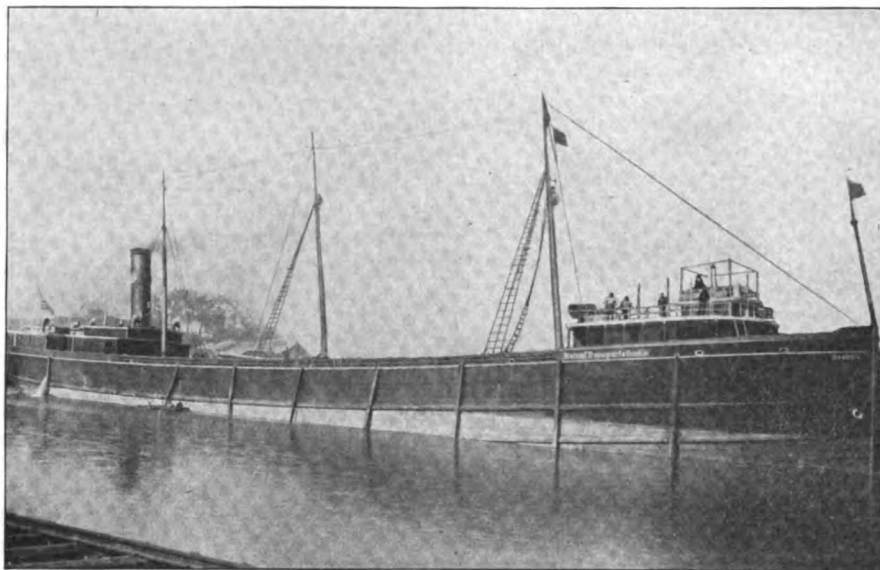
The *NEW YORK* was fitted originally with two triple-expansion engines with cylinders 45, 71 and 113 inches and 60-inch stroke. The allowed working pressure was 150 pounds.

Engine Breaks Down

On the young man's first watch below, when the ship was plunging into a stiff northeaster, the forward main-bearing stud, 6 inches in diameter, of the port high-pressure engine broke and he had the pleasure of seeing a "20-knotter's" engine crew "turn to." It was an education and an opportunity to see the way the break was handled and repaired in such a matter that the ship was overdue only a few hours.

If a man desires to see men and machinery work at their level best and also if he has the wanderlust in his makeup, the writer knows of no better education or environment than the engine room of a seagoing steamship. Neither does he know of any better education to enable men to cope with emergencies, for it fully vitalizes and energizes a human being to exert the level best that is in him. There are no clocks, no overbearing bosses, no fetters and no endlessly repeated processes which wear down the human body and mind as in other pursuits.

At the time of bringing out the *St.*



LAKE FREIGHTER CAMBRIA

LOUIS, the young man was asked the question as to whether he would rather go as chief engineer of the ILLINOIS or as one of the 24 assistant engineers of the St. LOUIS, to which he well remembers saying that he was in the company to do as he was told. About this time he was assisted by the company in obtaining an unlimited ocean steamship's chief engineer's license at the age of 27.

After making a voyage or two more, however, the young man was transferred to Cramps shipyard with a picked crew from all of the other ships in the line, to study the St. LOUIS before she started on her career which has been a very successful one throughout her life as a ship, and at times a spectacular one.

Takes a Shore Job

After acting as junior third engineer on the St. LOUIS for four or five voyages, he was promoted to senior third assistant engineer in charge of all boilers in port and on the senior first assistant engineer's watch at sea, with

his friend and able engineer, John Hunter, who is now with the Emergency Fleet corporation and who has distinguished himself many times since the old days. Incidentally, Mr. Hunter drove the first rivet for the Emergency Fleet corporation.

While in the St. LOUIS, the young man decided that it would be well for him to take out an English engineer's license and through the assistance of his fellow shipmates, he was granted a board of trade certificate of competency as an engineer in London by J. McFarlane Gray, Nov. 6, 1895. After the examination, Mr. Gray digressed somewhat from his enviable position as chief examiner of the British board of trade then located at 79 Mark lane, London, and gave the young man a lot of splendid advice about continuing in the profession of marine engineering. All of the older men were always encouragers of young men.

After being in the St. LOUIS for 12 or 13 months, through the assistance of John Walls, an able engineer who was chief engineer of the St. LOUIS,

the young man was transferred and promoted to the St. PAUL to replace one of the first assistant engineers who resigned from that ship. The St. PAUL was originally fitted with two quadruple-expansion engines, each having two 28½-inch high-pressure cylinders, one 55-inch first-intermediate, one 77-inch second intermediate and two 77-inch low-pressure cylinders, with a stroke of 60 inches developing 20,000 to 22,000 indicated horsepower. The working pressure was 200 pounds per square inch.

His Last Ship

He went as junior first assistant engineer in charge of the 12:00 to 4:00 watch of the St. PAUL, which was his last ship. He served from April until July with the chief engineer of this ship, James Carnegie, who since that time has been occupying an important position with the International Navigation Co., now the International Mercantile Marine Co., as superintending engineer in foreign and American ports. He was a man who would take hours to explain the "ins and outs" of these massive engines and boilers and their functions to the younger engineers.

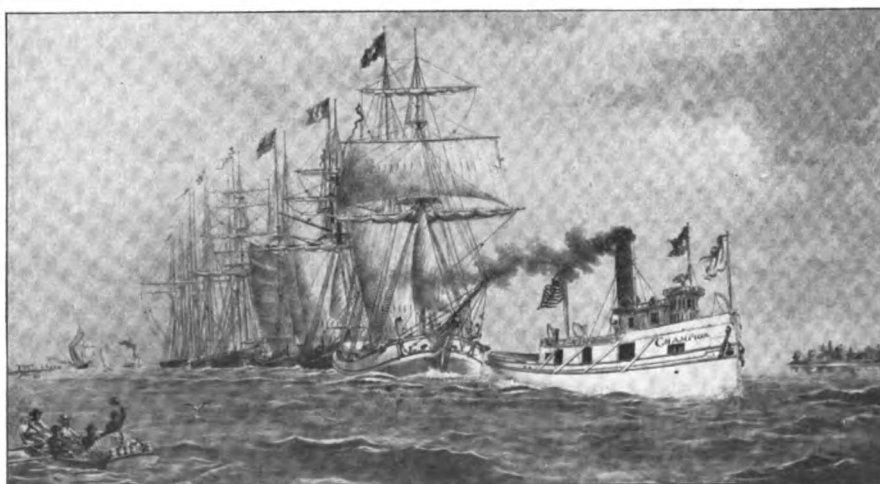
The young man left in July to enter the employ of one of the oldest and largest cotton corporations in America which at that time had 175 engines of all sizes, kinds and descriptions. After becoming well installed, the young man became interested in inventions of different boilers and took out several patents on water-tube boilers and steam superheaters, 113 claims, and patented in seven different countries. None of the patents taken out at this time turned out to be of any use other than for the education which the young man received in developing them.

During the young man's work for the cotton corporation, through the influence of another engineer, he became interested in the standardization of a much used and dangerous steam apparatus, and served six years on a committee to formulate a standardization of construction of this apparatus for the use of one of the states.

Becomes Consulting Engineer

After serving this corporation for 13 years, during which time he practically redesigned and rebuilt the motive power of their entire property and personally supervised the installation of a great plant in the south for them, the young man went into the consulting engineering business, specializing in light, heat and power.

Later on, on account of the work he did for the state, he was made chairman of a committee for a great engineering society, to formulate a standardization for the same steam



CHAMPION—FAMOUS OLD LAKE TUG BOAT

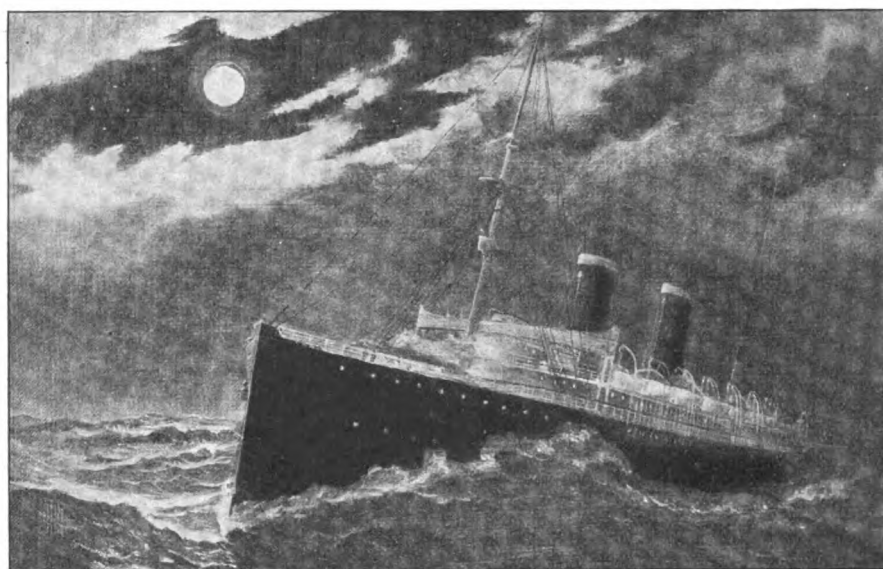
apparatus mentioned above which standardization may be adopted some time by the federal government. Thus far it has been adopted by a great many states and municipalities, and more are following yearly.

During all these years this engineer has carried forward considerable research and development of steam and power machinery, some of which are as follows: He was one of the early users and advocates of stage and exhaust steam from turbines for heating and manufacturing purposes; one of the first to install marine type engines, using steam at 200 pounds pressure, direct connected to factory shafts; one of the first to use top exhaust from large steam turbines; one of the first to place steam turbines on steel entablatures, with the main members transverse to the turbine shaft; the first in the United States to install a large geared turbine driving a factory with ropes, 1620 brake horsepower through 48 $1\frac{3}{4}$ -inch ropes with 160 pounds steam and 28-inch vacuum; one of two inventors who together have evolved a boiler which can generate with comparative ease 25,000 boiler horsepower, or evaporate into steam 750,000 pounds of water per hour and which can be operated in quarters, halves, three-quarters or four-quarters; one of the few to evolve a complete power plant analysis embodying complete segregations of light, heat and power in their generation and application, and bringing the completed whole to a financial basis, and also a great many lesser but special developments and arrangements of power equipment necessary to a consulting engineer's profession.

Creates a Trust Fund

In grateful recognition of the opportunities given the engineer mentioned, when he was learning his profession, by older men, he has created a trust fund and delivered it to a society for the advancement of the sciences having to do with the conservation of fuels used in the generation of light, heat and power, which trust fund is to be held by this society forever, and its income paid annually to any person or persons making noteworthy steam-engineering improvements.

The man writing this article, in quite inverse order, freely states that whatever he has accomplished is due to his early and severe basic training and to the men who trained him. He wishes especially to call the attention of young men to the fact that in engineering of any branch whatsoever, all that is necessary for complete suc-



STEAMER ST. PAUL—FROM AN OIL PAINTING

cess is to keep hammering constantly and sticking to one line of endeavor. No business will bring any greater financial reward than marine engineering; furthermore, at this particular time, with a great merchant marine being constructed, it is a splendid business to be in, especially for young men. As with all other businesses, however, it is no bed of roses and if a man is determined to live on the fat of the land without working, he should not attempt marine engineering.

(Signed) An Ex-Marine Engineer.

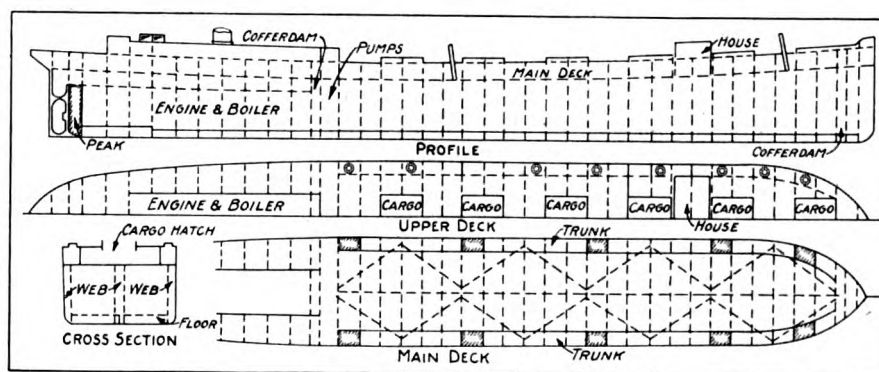
Method of Bulkheading

James J. Lynn, Port Huron, Mich., has applied for a patent on a new system for arranging bulkheads in ships, so that the cargo space is divided in such a way that different grades of cargo may be carried with facility. The purpose of the inventor is to provide especially for the transportation of liquid in bulk.

As shown in the accompanying illustration, the cargo space is divided into a series of holds by diagonal vertical bulkheads extending in pairs

from the outer plating to the middle line of the ship. These bulkheads are so arranged that a series of triangular holds are formed along the sides of the ship, with a series of quadrangular holds in the middle, between the triangular ones. This arrangement is effected by a comparatively simple system of plates and angles. Liquid-proof joints, of course, are provided between adjacent bulkheads and between the ends of the bulkheads and the skin of the ship. The arrangement is suited to vessels of various types. The accompanying illustration shows the bulkheads applied to a shelter deck vessel, arranged for carrying oil above the main deck.

There has been launched at Rio de Janeiro, at the Retiro Sandoso yard of Vicente dos Santos Caneco & Cia., the sailing ship PRESIDENTE WENCESLAO, a vessel of 800 tons net registry, named in honor of the president of the republic. The ship is, with the exception of two small warships, the first vessel of any important size launched in Brazil for 28 years. Built under survey of Lloyd's register she is constructed of wood sheathed with copper and iron.



METHOD OF BULKHEADING STEAMER FOR CARRYING LIQUID CARGO

Spain to Build Concrete Vessels

A Barcelona Concern Which Specializes on Reinforced Concrete Work is Building Concrete Ships—Plans Made to Launch 40,000 Gross Tons in 1918

TO CARRY on the commerce of the world it is necessary for all maritime nations to maintain a vast armada of merchant vessels. In the easy times of a score of years ago, this was not a difficult procedure, as both labor and shipbuilding materials were plentiful and cheap.

With the steady march of progress, however, times have changed. Prosperity has caused workmen's wages to soar to unheard of figures while such heretofore common materials as wood and steel are commanding prices that are practically prohibitive to the builder of merchant tonnage for private enterprise. For these reasons, naval architects have turned their attention to cheaper materials which has resulted in the concrete ship.

Concrete construction as applied to barges and small boats is nothing new for, as described in THE MARINE REVIEW of August, 1917, several vessels of this type are in successful operation. It should be borne in mind, however, that the majority of cement constructed tonnage up to the present day consists of scows and barges, thus real concrete ships, in large numbers, are yet to come.

Spain ranks with the oldest and most historical of maritime nations, ever to be remembered as the country from which Columbus sailed with his three little vessels, the SANTA MARIA, PINTA and NINA, on a voyage of discovery, the ultimate result of which was to put the United States on the map. And now, not to be outdone in modern maritime progress, Spain is preparing to build reinforced concrete ships.

In the historical city of Barcelona,

the Works & Pavement Corp. has successfully completed several important public works of reinforced concrete and in view of the fact that it believes that concrete will ultimately be used in ship construction on a large scale, it has engaged in the concrete shipbuilding business. The corporation is at present constructing its first cargo ship. It is said that the company has acquired several patents that give it a monopoly on various processes whereby it can turn out concrete ships quickly and economically.

How Concrete Ships Are Built

The accompanying illustrations show a few of the details of building concrete ships. Fig. 1 is a view taken inside the mold in which the concrete ship is to be poured. This view is taken from the midship section of the vessel, looking aft. It is seen that a mold is first constructed to correspond to the shape and size desired in the finished ship. The mold is firmly tied together, to prevent spreading, by means of numerous lateral braces. The arrangement of the reinforcing bars is plainly illustrated. It is seen that they are interlaced closely and tied at each intersection to prevent disturbance when the heavy mass of liquid concrete comes in contact with them.

Fig. 2 illustrates several details of the preparatory work. This view is taken near the stern end of the mold and the workmen shown are fastening the mold timbers to the stern forms. This illustration also shows that the completed vessel is to have the graceful afterbody of a ship instead of the unwieldy appearance of a scow or barge.

During the present year the company plans to build 40,000 gross tons of concrete ships. Three standard types are contemplated of 300, 500 and 1000 tons capacity, respectively. The company plans to extend its plant as soon as business warrants. For this purpose it has acquired a site on the Mediterranean sea with an area of 250,000 square meters which corresponds approximately to 2,097,000 square feet. The water frontage is 2000 meters, or 6555 feet, which it is said will provide ample room for building 30 ships at a time. The company plans eventually to build concrete ships up to 6000 tons capacity. Whether or not concrete ships are to prove a commercial possibility is a question of conjecture. It is obvious that the comparatively heavy sections, necessary for stability, will cut down the carrying capacity materially. In other words a concrete ship is comparatively heavy when free of cargo.

On the other hand concrete ships possess some advantages that are lacking in vessels made of wood or steel. A concrete ship properly constructed should be absolutely watertight and it should remain so throughout its life which, barring accidents, would amount to several thousand years, at the least.

It is said that algae and various forms of sea growths are removed from concrete surfaces very easily which is a point in favor of the concrete vessel, as it is always an expensive operation to clean a vessel's bottom. Again, as compared with wooden ships, concrete vessels are absolutely proof against ship worms which prove so destructive to vessels that sail in tropical waters.

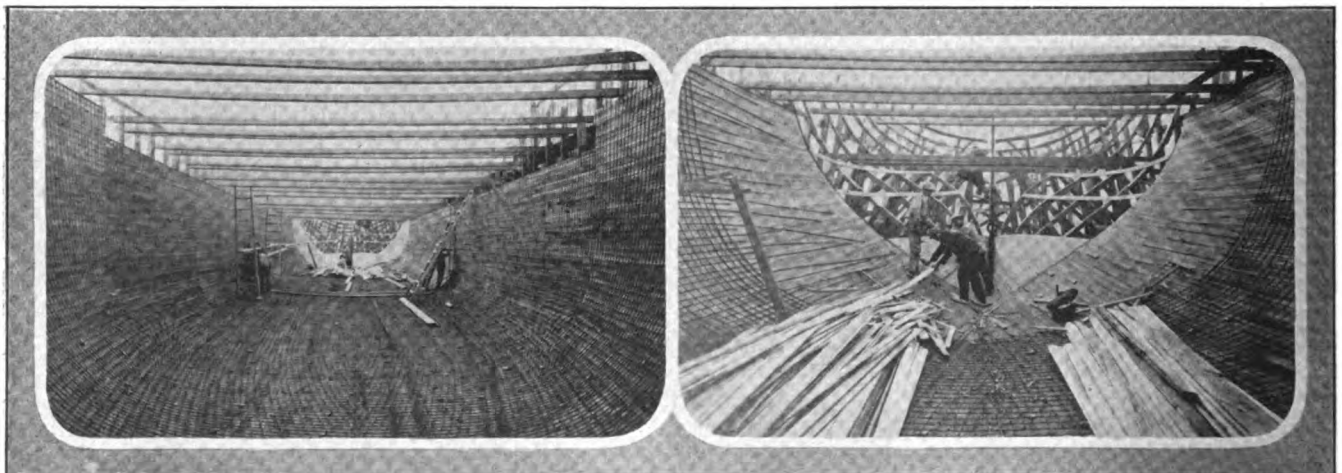


FIG. 1—MIDSHIP VIEW OF A CONCRETE SHIP IN COURSE OF CONSTRUCTION—NUMEROUS REINFORCING BARS WILL HOLD THE CONCRETE IN PLACE. FIG. 2—A VIEW TAKEN NEAR THE STERN—THE GRACEFUL STERN LINES ARE PLAINLY SEEN FROM THE SHAPE OF THE MOLDS

NEW TYPE OF CARGO CARRIER WINS FAVOR ON PACIFIC

By R. C. HILL



A Steel Cargo Vessel Designed and Built on the Pacific Coast

ON the Pacific coast when talking about new steamships, one commonly hears reference to the "8800-ton deadweight" type. This standard type of cargo carrier has been developed by the Skinner & Eddy Corp., Seattle, until today it is estimated that more vessels of this size and general standard are under construction in the Pacific northwest than of any other type.

About two years ago, D. E. Skinner and John W. Eddy, who had found their initial success in the lumber industry, determined to build two steel cargo steamships for their own use and, accordingly, started a shipyard in Seattle. Preliminary work was just under way when Norwegian owners, with their usual business sagacity, began to clamor for tonnage. The two original vessels were built to the order of B. Stolt-Nielsen, Haugesund, Norway, and contracts were taken for others. From the first, this yard registered a phenomenal success. The Skinner & Eddy Corp. has in the short space of two years placed itself in the front ranks of enterprising American shipbuilders.

The first keel for a standard 8800-ton type freight vessel was laid in May, 1916. On Sept. 21, of the same year, the NIELS NIELSEN was launched. A month later the HANNA NIELSEN was sent into the water. Since then an average of almost one steel ship a month has been maintained. In the first 12 months, nine hulls were sent into the water. To March 1, 1918, the total launchings numbered 16, thus establishing a record believed to be held by no other yard in the United States.

This plant now employs about 6400 men. The morale and *esprit de corps* of this organization are second to none. The loyalty of the rank and file is

noteworthy. Their devotion to David Rodgers, the superintendent, is one of the outstanding features of this great plant and to it the owners attribute much of the yard's success.

Since Sept. 21, 1916, the Skinner & Eddy Corp. has launched thirteen 8800-ton steel ships and three steel tankers from 9500 to 10,000 tons deadweight each, or a total of 143,500 deadweight tons. This is a record of which every employe of the yard is proud but, during 1918, it is expected that past achievements will be thrown into the scrap heap.

Has Made Many Records

Of the 16 vessels launched, four have been delivered to Norwegian owners, one to French owners, and one vessel ordered by the Norwegians is under the American flag. Of the others, six ordered by private owners have been launched to the account of the United States shipping board and three direct contracts for the government have been launched, two being already in service.

Of the many remarkable records for speed registered by this yard, the best is the launching of an 8800-ton steel steamship 64 working days after the keel was laid. Another vessel was delivered to the government in 95 working days after the keel was laid, although launched in 72 working days. So many records for speed have been attained by this yard that attention has been directed to it from all parts of the country and official Washington has commended the work of the Skinner & Eddy Corp.

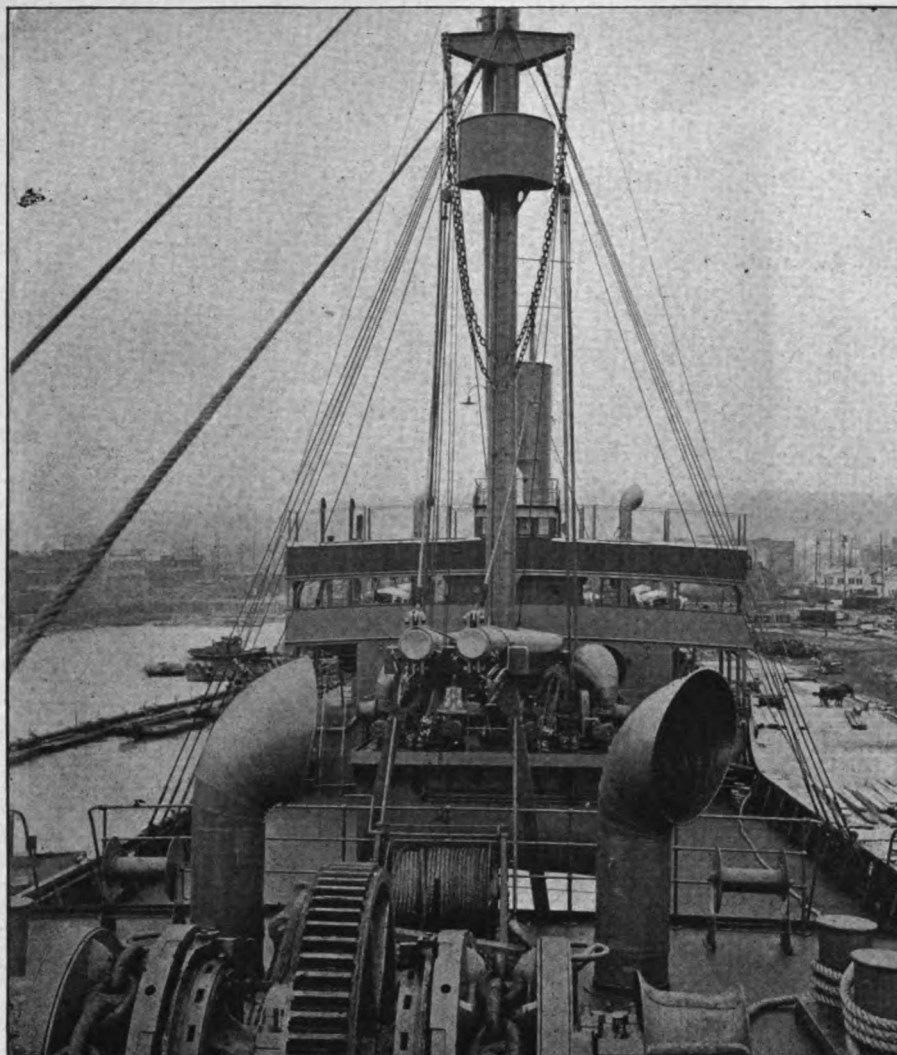
When the Skinner & Eddy Corp. was organized, it was decided to build a standard type of vessel suitable for general ocean-cargo service, and which would embody in its design those fea-

tures of economy, convenience and durability which modern shipbuilding and ship operating practice have demonstrated to be desirable.

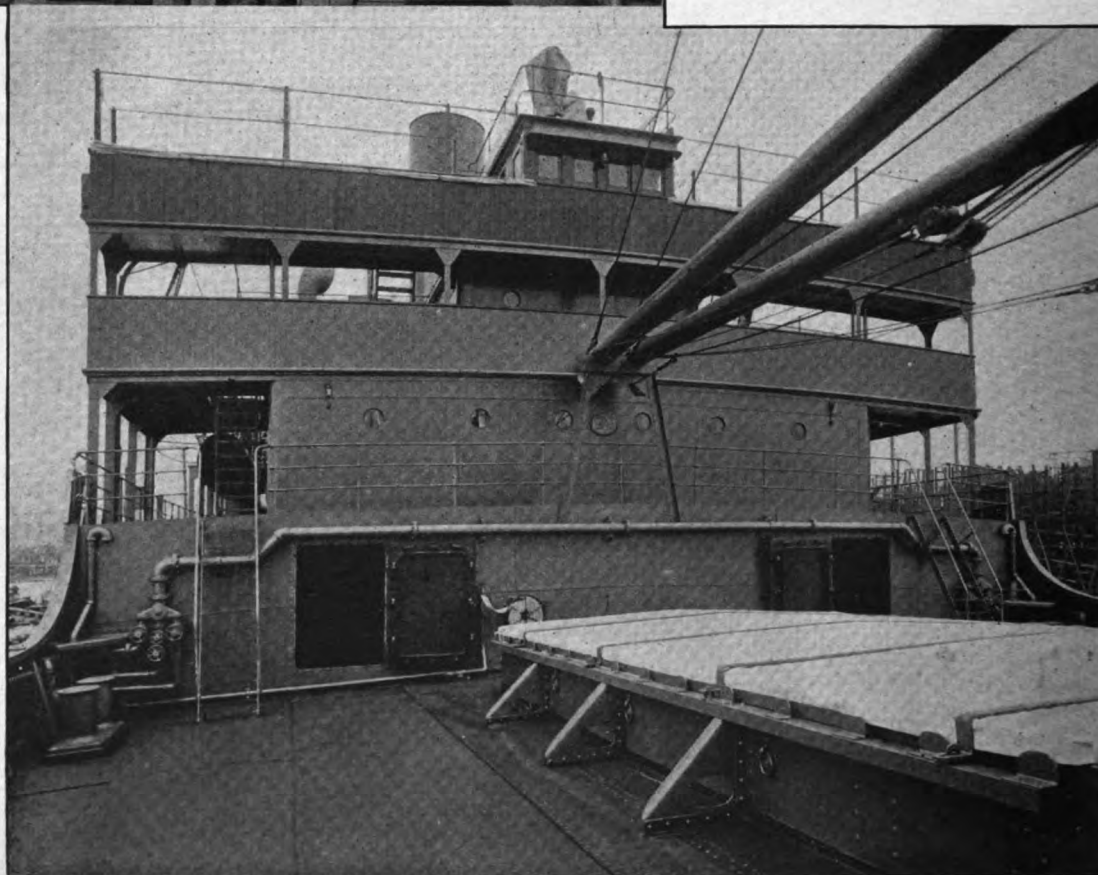
The officers of the corporation were familiar with the satisfactory performance of the steamship ROBERT DOLLAR, built at Port Glasgow, in 1911, and now flying the Japanese flag as the UNKAI MARU No. 5, the record of this vessel being well known to shipping men of the Pacific coast. In a general way, this steamship was selected as the prototype of the proposed standard vessel, insofar as determining the requirements which were to be equaled or exceeded in the new design. No plans or photographs of the ROBERT DOLLAR were utilized, or even consulted, as the corporation's technical staff were expected to develop an entirely original design, unhampered by the necessity of imitating some existing vessel. The result has been the creation of a type of vessel, entirely distinct and individual, and embodying many original and unusual features which subsequent experience with vessels built from these designs has proved satisfactory and desirable.

The first vessels turned out by the Skinner & Eddy Corp. have sustained the faith of their builders. They have undergone heavy weather and hard usage but they have proved all that was expected of them. The success of this type of cargo carrier is assured.

The first of these vessels to be completed was the NIELS NIELSEN, built to the order of B. Stolt-Nielsen, Haugesund, Norway. She was quickly followed by the HANNA NIELSEN, LUISE NIELSEN and STOLT-NIELSEN, while three other vessels for the same owner have been commandeered by the United States government and are now nearing



The upper view is taken from the forecastle deck and shows the general appearance looking aft. The lower view shows the poop, bridge and wheelhouse.



completion. The last vessel of this type built by the Skinner & Eddy Corp. for private owners was the LIEUTENANT DEMISSIESSY, built to the order of the Messageries Maritimes, Marseilles, France. This vessel left Seattle for France by way of the Orient last October and is now in the far eastern service of this prominent French steamship line.

Details of New Type

The principal particulars of the LIEUTENANT DEMISSIESSY, as furnished by M. H. Keil, naval architect and designing engineer for the Skinner & Eddy Corp., are as follows:

Length over all, 423 feet 9 inches; designed L. W. L. length, 410 feet; Beam molded, 54 feet; depth molded, 29 feet 9 inches; draft, designed load, 24 feet 1½ inches; gross tonnage, 5745; net tonnage, 4400; cubic cargo capacity, cubic feet, 460,000; fuel tanks, tons, 1080; bunker capacity, tons, 1200; fresh water tanks, tons, 200; speed, loaded, knots, 11.

In general, the vessel is of the conventional, poop, bridge and forecastle type, with machinery amidships. Many important features have, however, been introduced which are designed to promote economy and convenience of operation.

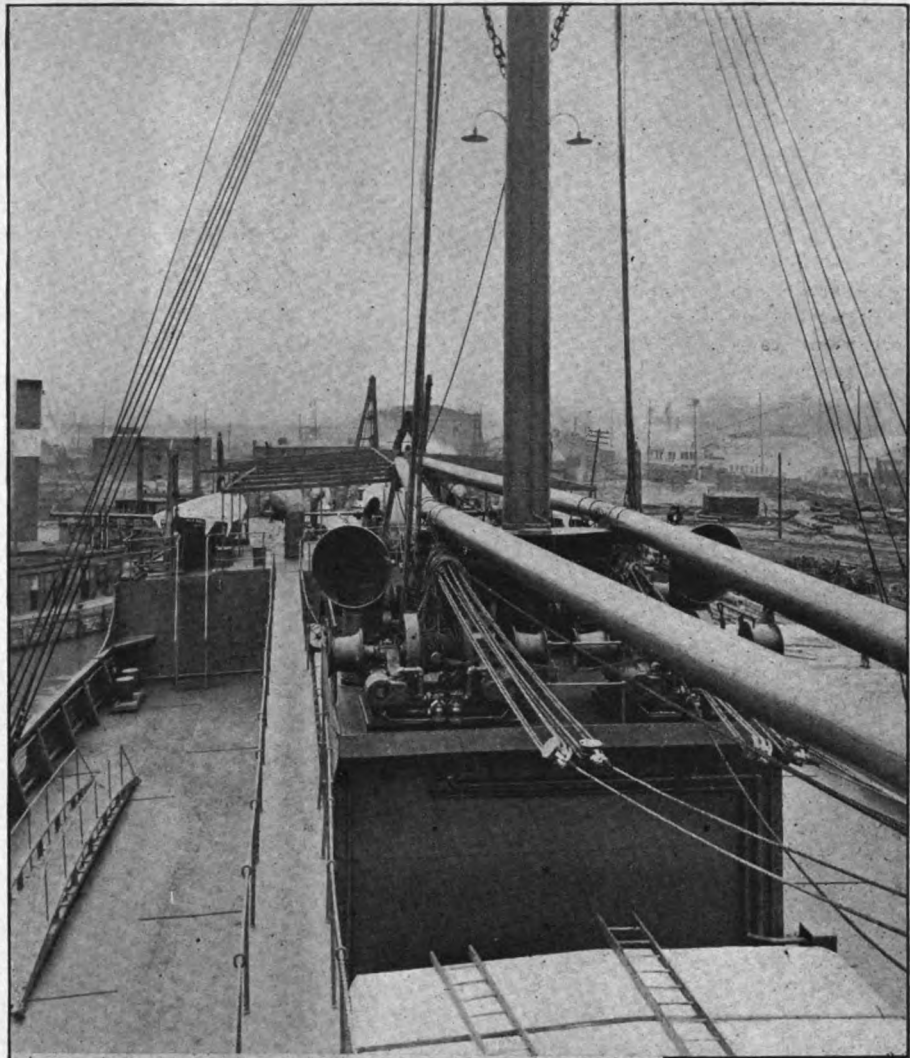
The hull is constructed of steel and was built to Lloyd's rigid requirements and in full conformity with the rules and regulations of the United States steamboat inspection service. The inner bottom extends the full length of the

vessel, and is constructed for carrying either fuel oil or water ballast, except that the compartments under the machinery space are used for reserve feed water.

Bulkheads are Watertight

The vessel is divided into six watertight compartments by transverse watertight bulkheads which extend to the upper deck. An additional oil-tight compartment is built in just forward of the fire room, which is used as a fuel oil settling tank. This tank is divided into two oil-tight compartments; each compartment having sufficient capacity for 24 hours' steaming.

In order to dispense with the usual large number of small beam stanchions which are used to support the decks and which seriously interfere with the rapid stowage of cargo, wide spaced pillars and girders were adopted. This is a system which is rapidly becoming universal in cargo ship construction, and has demonstrated its practicability and convenience under service conditions. By this arrangement, strongly constructed pillars, built up of plates and channels, are fitted near the corners of the cargo hatches, attached at their heads to a rigid girder, running all fore and aft, except in the machinery space where it is strongly connected to adjacent bulkheads, casings, etc., in such a manner as to effect a proper termination. Decks, casings, deckhouses, etc., are built in accordance with the



The upper view shows the deck as seen from the starboard side near the foremast. The lower view shows the cargo winches at the mainmast.

best modern practice, an effort being made to combine simplicity and economy in construction with ample strength and durability.

Cargo is handled by means of eight cargo booms mounted on the fore and main masts and two shorter booms mounted on derrick posts located on the bridge deck amidships and serving No. 3 cargo hatch. These booms are of sufficient length to afford an ample outreach beyond the ship's side. All important cargo blocks are of metal and special attention was given to securing serviceable running rigging.

In order to give the winchman a clear view into the hold and over the ship's side so that the loading and discharging of cargo would be under better control,

separate 1-berth rooms. Each room contains a built-in berth, with drawers below, a wardrobe, stateroom washing fixture, upholstered settee, a writing desk and one or two chairs. These rooms are fitted with oak furniture. The captain's private quarters are larger and include a separate bath room fitted up with the most modern sanitary fixtures. The officers' saloon, located in the forward deck house, is paneled in quartered oak and is fitted with upholstered settees, a dining table with revolving chairs and sideboard. Service lockers are fitted in the corners of this apartment.

Geared turbines are employed. They are of the Curtis type, manufactured by the General Electric Co., Schenectady,

system is installed with generators in duplicate. These generators are driven by reciprocating engines and were built by the General Electric Co.

A feature, not generally found on cargo vessels, is the refrigerating plant which is used to cool the cold storage rooms where fresh provisions are carried. This machine is of 2-ton capacity.

Adjacent to the engine casing and the upper deck is a well equipped machine shop where emergency repairs to the machinery can be made at sea. In addition to the usual equipment of hand tools, the shop contains a lathe, drill press and shaper driven by electric motors.

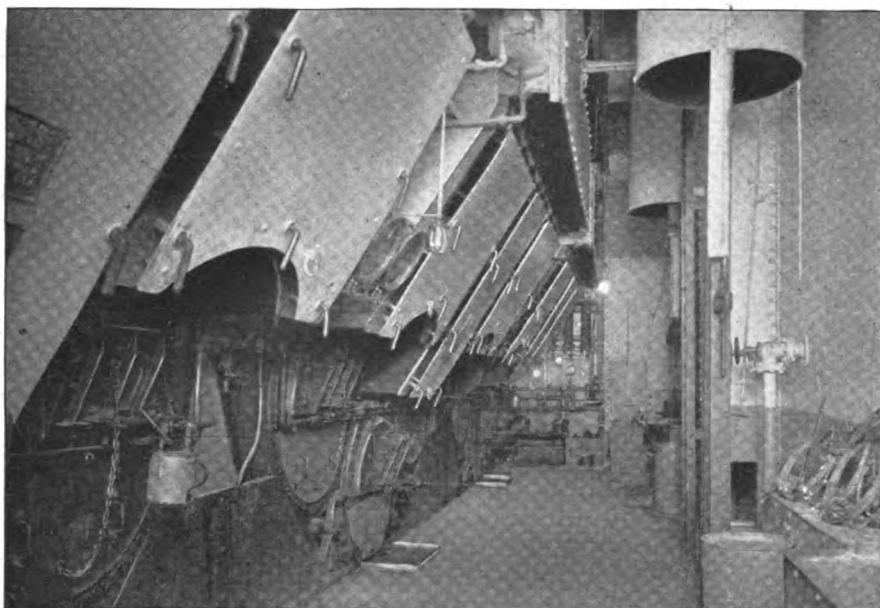
Leases Big Pacific Yard

For the purpose of executing government contracts for the installation of boilers and machinery in the hulls of wooden ships now being built in the Pacific northwest for the United States shipping board, D. W. Hartzell, Inc., has leased for a long term of years the repair yard and building plant of the Winslow Marine Railway & Shipbuilding Co., Winslow, Wash., taking possession at once.

The plant, which was established years ago by the well known shipbuilders, Hall Bros., was purchased in 1916 by James Griffiths & Sons, who have since operated it successfully. At Winslow they built the ore carrier and towing steamer ANYOX, now in operation between Seattle and Alaskan ports, in addition to doing a large amount of repair work on the marine ways.

Mr. Hartzell, a well known young business man, who has attained marked success as treasurer of the Northwest Trading Co., importer and exporter, has associated with him in the new enterprise J. F. Thorne, as secretary, Mr. Hartzell being president and treasurer. F. F. Sinks, former general sales manager of the Pacific Coast Steel Co., has been appointed general manager.

The new company has assumed a large amount of government work for installing engines and machinery in wooden hulls under government contract and the Winslow plant is regarded as an ideal place for this work. It is expected that 150 workers will be added at once. Mr. Hartzell intends to proceed with general ship repair work in addition to executing the contracts for the shipping board. The Hartzell program contemplates the building of wooden and steel ships in the future if conditions are favorable. The plant covers 90 acres, has 3300 feet of waterfront, has a marine railway of 4000-ton capacity, one building way in operation and ample space for additional ways.



A GLIMPSE OF THE FIRE HOLD

the winches have been mounted on strongly constructed platforms, raised about 10 feet above the upper deck. These platforms have been built in the form of completely enclosed houses which serve the double purpose of a rigid foundation and a convenient, well protected enclosure for the stowage of deck gear.

An 8 x 10 single-gear cargo winch, built by the Vulcan Iron Works, Seattle, from designs approved by the engineering staff of the Skinner & Eddy Corp., is fitted at each cargo boom, located so that only one operator is required to handle each pair of winches.

The quarters provided for the officers and crew are unusually commodious for a vessel of this class. The regular crew are berthed aft in the poop. Shower baths, mess rooms with pantry conveniences separate from sleeping quarters, modern sanitary appliances, adequate locker space and a hospital are provided, all of a plain but substantial character.

The officers are accommodated in

N. Y. They are designed to develop 2500 horsepower and are geared down so as to drive the propeller at 90 revolutions per minute.

Steam is generated in three Scotch marine boilers, 14 feet 9 inches diameter and 11 feet long, each fitted with three Morison suspension furnaces. The furnaces are arranged and complete equipment supplied, so that either coal or oil may be used for fuel. The necessary change in fittings can be effected in a few hours so that either kind of fuel can be used on short notice. The working steam pressure is 210 pounds per square inch. Each boiler is fitted with a steam superheater which raises the temperature of the steam 50 degrees Fahr. above normal.

The auxiliary machinery is of modern type. All pumps are of the reciprocating type with the exception of the main circulating pump which is of the centrifugal type. The condenser is made exceptionally large to insure a high vacuum. A complete electric lighting

How Wooden Ships Are Laid Off

First of Two Articles on the Geometry of Wooden Shipbuilding

—This Installment Takes Up Fundamental Considerations

By Samuel J. P. Thearle

LAYING down or laying off is the name given to that art by the aid of which the shipbuilder determines the forms of the various pieces of which a ship's hull is composed, so that when they are put together in their proper positions, they shall collectively constitute the frame of a ship, having the form and dimensions intended by the designer. It is sometimes styled the geometry of shipbuilding, and is, in fact, a practical application of descriptive geometry to that art. Its various problems are solved upon the floor of a building known as the mold loft, where the drawings furnished by the designer are transferred in chalk lines in full size, and then by the aid of geometry, and in the manner discussed in the following paragraphs, the draftsman determines and draws in the shapes of the various components of the frame. Molds or patterns are made to the lines, and with them and other data furnished by the draftsman, the workmen are enabled to trim the timbers, or bend the angle-irons, and place such marks upon them as shall leave nothing but the putting together and fastening them in their places in order to construct the frame of the ship.

Geometry the Prime Factor

The application of geometry to shipbuilding has now become almost universal. In some small yards, however, schooners, brigs, and such minor craft, are not laid off; but the stem, stern-posts, and the keel having been set in position, the form of the hull is shaped in on one side with battens bent to please the eye; and molds having been made to the timbers on that side, they are reversed for the timbers on the other side. The timbers are kept in place by cross spalls, shores, and ribbands, the frame is planked, and thus the hull is built. Although this mode is not very objectionable practically in vessels of such description that no special designed is required, it could not be entertained for a moment in navy yards or large private firms, where all ships are built from well matured designs that must be adhered to in their entirety; besides which, owing to the ships being of so large a size, this mocking system is economically impracticable.

To an ordinary observer, the determination of lines on a ship's surface

presents itself as a series of problems of no little intricacy; and, indeed, were it not that all, or nearly all, such lines as the naval architect requires, are produced by plane intersections with the ship's surface, their determination, owing to the undevelopable nature of that surface, would be both approximate and difficult. To solve these problems is the province of laying off. A study

An Acknowledgement

IN response to an insistent demand, THE MARINE REVIEW has arranged to publish the accompanying treatise on laying off wooden ships by Professor Samuel J. P. Thearle. Two installments will be presented of which this is the first. Professor Thearle's book on this subject, which was first published nearly 50 years ago, is a classic in its field. The material embraced in the accompanying articles was abstracted from a copy of the original text loaned by John W. Perrin, librarian, Case Library, Cleveland. Very few copies of the book, which was published originally by William Collins Sons & Co., London, remain. Although important changes in wooden shipbuilding methods have taken place since Professor Thearle's day, the science of laying off, is based primarily on mathematical considerations that are unchangeable. Professor Thearle's work therefore applies to present day conditions. The student of laying off will find a knowledge of descriptive geometry essential to a complete understanding of the subject.

of this subject will be greatly assisted by a previous perusal of any standard work on descriptive geometry; and a clear conception of certain of the more difficult problems of ship design will be found impossible without an acquaintance with that portion of descriptive geometry which treats of straight lines and planes.

Before proceeding with the practical operations in laying off, it is necessary to state and explain the following preliminary proposition:

A point in space is determined, or fully known, when its distances are given from three planes mutually at right angles.

Consider $AOCD$, $BOCF$, $AOBE$, Fig. 1, to be three sides of a square-cornered cubical box of unlimited dimensions;

that is, let each of these plane surfaces extend indefinitely from OB , OC and OA . For the present, suppose $OBEA$ to be the bottom; then, if the perpendicular distances of a point in the bottom from the sides OB and OA be given, a mechanic with his rule and square will immediately find its position by measuring from the point O along OA , the given distance OX of the point from the line OB , and also measuring from the point O along OB , the given distance OY of the point from the line OA ; then by squaring out lines from the points X and Y , he knows that their intersection is the point P required. This action in the everyday life, of the skilled mechanic, is no other than that of determining a point whose co-ordinates, are given; the distances OX and OY being the co-ordinates. OB and OA are termed the axes.

Three Points Necessary

But a ship being a solid and not a plane, another dimension must be introduced before the required point can be determined, namely, height or depth; hitherto only length and breadth have been considered. Returning to Fig. 1, it is seen that if a line be drawn through the point P perpendicular to the plane $OBEA$, or, which is the same thing, parallel to the line OC , there are any number of points in this line, each of which is distant PX and PY from the planes $AOCD$ and $BOCF$ respectively, but at any fixed distance from the plane $AOBE$. If, then, a height PQ be taken in this line, a point Q is found, which is distant PX , PY , and PQ from the planes $AOCD$, $BOCF$ and $AOBE$, respectively. Now there is only one point which fulfills these conditions, for only one perpendicular can be drawn through the point P , and there is only one point in that perpendicular which is distant PQ from the plane $AOBE$. Hence the point Q has been determined by having given its distances from three planes mutually at right angles.

The planes $AOCD$, $BOCF$ and $AOBE$ are termed in geometry planes of reference or co-ordinate planes, and have their laying off counterparts in the sheer, body and half-breadth plans, respectively.

As we have already stated, nearly all the lines on a ship's surface which are employed in laying off, are contained

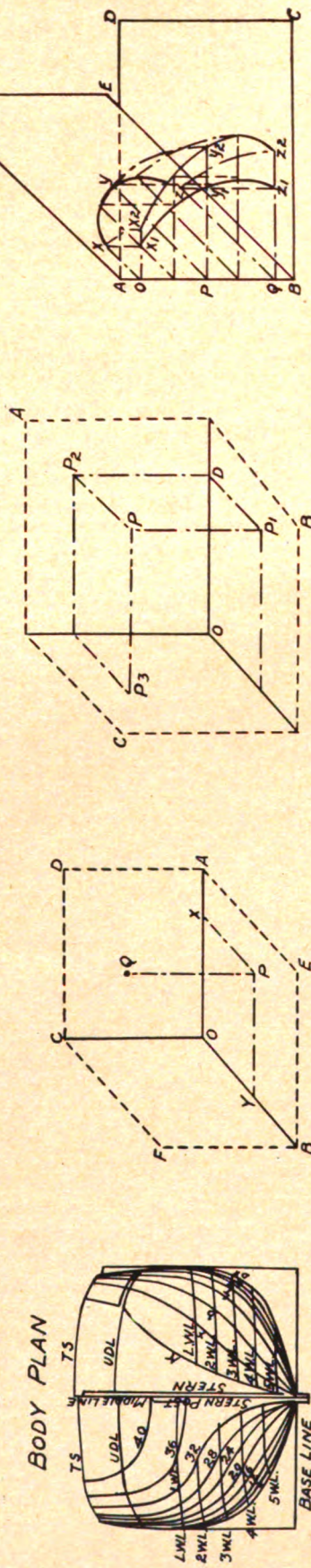


FIG. 1

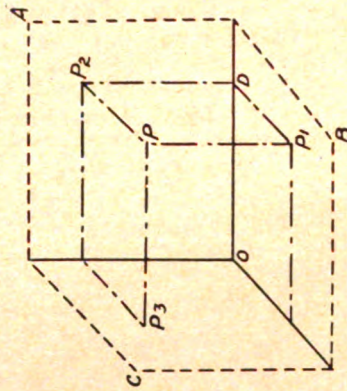


FIG. 2

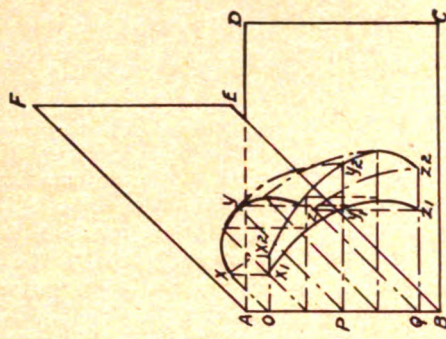


FIG. 3

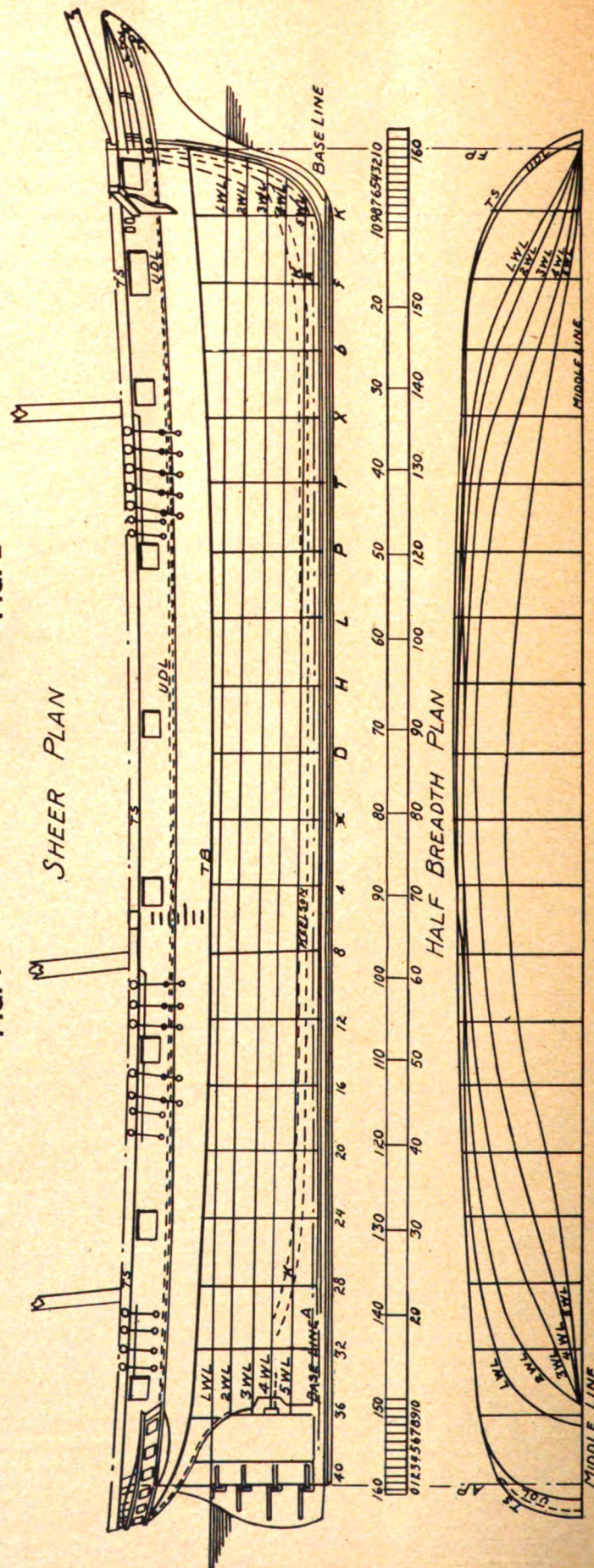


FIG. 4

FIG. 1—PROJECTING A POINT ON A PLANE. FIG. 2—DETERMINING A POINT IN SPACE. FIG. 3—RABATTING A LINE. FIG. 4—SHEER DRAFT OF A SLOOP OF WAR

in planes; hence, they are drawn upon a plane surface, and in order to have a correct conception of the forms of the lines, they are projected upon three planes of reference.

The projection of a point on a plane is the foot of the perpendicular let fall from the point upon the plane.

The projection of a line upon a plane is the line which passes through the feet of all the perpendiculars which can be let fall from the line to the plane.

The plane upon which the perpendicular is let fall, is termed the plane of projection; and the perpendicular itself is known as the projecting line.

When a straight line is projected upon a plane, the plane containing the projected lines is termed the projecting plane.

When a line is in a plane parallel to the plane of projection, the projected length and form are the same as the true length and form of the line; but if the planes are not parallel, the projected line will not be similar to the real line; and the latter can then be determined by what is termed rabatting, to which we shall refer presently.

The intersections of lines with planes, and of planes with each other, are termed their traces; it is evident that the former are points and the latter straight lines.

Two Planes of Reference Required

The projections of all lines which are in a plane perpendicular to the plane of projection are straight lines, which evidently coincide with the trace of the former plane upon the latter.

When a line is perpendicular to the plane of projection, its projection will be the trace of the line produced to meet the plane.

The projections of a point upon two of the planes of reference, are all that is required to determine the point without the aid of the third plane. For, referring to Fig. 2, let P_1 be the horizontal, and P_2 and P_3 the two vertical projections of the point P ; it is seen that in each of the planes OA and OB , two dimensions enter, length and depth in OA , represented by OD and P_2D respectively; and length and breadth in OB , represented by OD and P_3D respectively. Hence, if only these two planes are given, the three dimensions required, length, breadth and depth, are known, which are sufficient to determine the point. The projection of the point P on the plane OC at P_4 , gives the dimensions breadth and depth; and as these are already known, the projection on that plane is not essential to a knowledge of the point when the projections on the other two planes are given. It is thus seen, that for the representation of the form of the ves-

sel by the method of projections, it is only necessary to have two of the three planes of reference; the three are, however, retained in order to give a clearer conception of the body projected, and for corroborative evidence; besides which, each of the plans contains lines which cannot be shown in their true shape in either of the others.

What Rabatting Is

It frequently happens that a line is in a plane which is not parallel to either of the planes of projection, and hence its projections do not show its true form. In order to obtain the latter, an operation termed rabatting is performed. It consists in hinging the plane containing the line about its trace with the plane which it is required to represent the line, or with a plane parallel to the last mentioned plane. In the first case, rabatment gives the line at once, and in the second case it has to be projected after being rabatted.

As an example of how a line is so rabatted, consider the following. In Fig. 3 let AB be the line of intersection of the two planes $ABCD$, $ABEF$, also, let xyz be a line in the latter plane which it is required to represent in the former. It is evident that the projection $x_1y_1z_1$ of the line is not its real shape, the planes not being parallel; it is therefore necessary to rabat or hinge the plane $ABEF$ about AB , until it coincides with the plane $ABCD$. From any points, x , y , z , in the line xyz , draw xO , yP , and zQ , in the plane $ABEF$ perpendicular to AB ; and from the points O , P , Q , draw in the plane $ABCD$ the straight lines Ox_2 , Py_2 , Qz_2 , perpendicular to AB . Then take $Ox_2 = Ox$, $Py_2 = Py$, and $Qz_2 = Qz$; through the points x_2 , y_2 , z_2 , draw the line $x_2y_2z_2$, and if the number of points x , y , z , taken are sufficient, the line $x_2y_2z_2$ will be the same as the line xyz .

Having thus briefly, and as simply as possible, stated the geometrical principles upon which the art of laying off is founded, and by which it is practiced, we will proceed to examine the manner of applying these principles and their equivalents in the art itself.

The Three Planes Explained

The three planes of reference are termed the body, sheer, and half-breadth planes; they are the transverse vertical, longitudinal vertical and the horizontal planes respectively. The various lines which are projected upon these planes constitute the body, sheer and half-breadth plans. In the body plan, all such lines as are in planes parallel to the horizontal plane, or perpendicular to the transverse vertical plane, will appear straight, as they are the traces of the

last-mentioned plane with the planes containing the lines. Those in the sheer plan, or perpendicular to the longitudinal vertical plane, will appear straight, for they are the traces of the longitudinal vertical or sheer plane with the planes containing the lines. Similar remarks apply to the half-breadth plan. In the body plan lines appear in their true form if the planes containing them are parallel to the transverse vertical or body plane; and similarly with regard to the other plans.

For the purpose of representing the form of a ship upon plane surfaces and laying her off, she is supposed to be cut by three sets of planes parallel to the planes of reference. Three sets of lines are thus given by the intersection of these planes with the ship's surface, and their projections are termed level lines, buttock or bow lines, and square stations, according as they are produced by intersections of the surface with horizontal, longitudinal vertical, and transverse vertical planes, respectively. The first appear straight in the body and sheer plans, but curved in half-breadth plan; the second are straight in the body and half-breadth, but curved in the sheer plan; and the third are straight in the sheer and half-breadth, but curved in the body.

Other Lines are Necessary

By means of either two of these three sets of lines, having given two of the plans, the other plan may be drawn; or having given only one of the sets of lines in the three plans, and the projection of another set of lines on one of the three planes of reference, the projection of this set on each of the other planes of reference can be determined. All this readily follows from the principles of projection already explained.

Besides the preceding, other lines are introduced into the plans for special purposes to be named hereafter; of these the most important are diagonal lines. These are produced by the intersection of planes perpendicular to the body plane, but inclined to each of the other planes of reference; their horizontal projections are termed horizontal ribband lines, but the lines themselves are known as diagonal lines.

By cutting the ship's surface more perpendicularly than those before mentioned, the diagonal planes give better intersections, and are thus of great service in "fairing the body", a process to be described further on; they have also other uses, which will be referred to in their proper place.

The portion of the design which contains the three plans we have just been describing, together with the

positions of decks, ports, and general outline of the hull, is termed the sheer draft, and this is the drawing which is chiefly required in laying off. Other data are required, but these will be given in their proper places; at present we will confine our attention to the sheer draft. And here it may be remarked that the several processes of laying off are dealt with in the following pages in the same order as the draftsman lays off his ship upon the mold-loft floor.

Before proceeding further, it is necessary that we should examine the sheer draft in order that we may become acquainted and familiarize ourselves with the names and uses of the various lines composing it.

The Sheer Draft

Fig. 4 shows the sheer draft of a sloop of war. This is a fair type of a sheer draft as prepared at the Admiralty for the construction of vessels in dockyards. In Fig. 4, the lines marked *2WL*, *3WL*, etc., are the projections of the intersections with the surface of the ship of planes parallel to the load water plane; they with *LWL*, the intersection of the load water plane, are called water lines. It may be here remarked that, unless it is otherwise stated, by "the surface of a ship" is meant the outside of the frames and not of the exterior plank, as, after the form of the ship has been designed, the plank is taken off by a process to be afterward described, and thus the building draft shows the surface of the frames.

The dotted perpendicular lines at the extremities, marked *FP* and *AP*, are the perpendiculars between which the length of the ship is measured. The other perpendicular lines in the sheer and half-breadth are termed square stations; they are projections, upon these plans, of intersections of transverse vertical planes with the ship's surface. In the body plan is projected only the intersections of the planes with the port side of that portion of the ship on the foreside of her fullest part of dead flat. By this means we have, without confusion, the projections in the body plan of the whole of the traces of these vertical planes with the surface. At the present time the alphabetical designations are sometimes discontinued, and the numerical mode is used for the two bodies, commencing forward or aft as the case may be. These plane sections are made at the joints of the two sets of timbers composing wooden frames, and at the sides of angle iron frames; they are generally equidistant. Until within recent years it was customary to make the dead flat interval five-fourths the breadth of

the others, this being done in order to allow room for a single timber frame, about which the relative positions of the component timbers of the frames were shifted, all the timbers on the fore side of the single timber being disposed by a certain rule, and those abaft it being disposed in a contrary manner. It should be further stated that the spaces between the joints of the frames of some recently constructed wooden war ships have been greater toward the extremities than at amidships, in order to lighten the framing at those parts which receive least buoyant support.

Again, referring to Fig. 4, *TS* is the topside line, and besides this the form of the upper deck, as projected in the three plans, is also shown: these are given in order to represent the form of the vessel above the water lines. Generally, a line, termed a top-breadth line, is drawn somewhere between the topside and load water line; and, in large ships, lines at the port sills are given for the same purpose.

The lines marked *K* show the upper and lower edges of the keelson, and at their extremities are shown the stemson and sternson.

The dotted line marked *A* is the upper part of the keel, the two lines next below are the upper and lower edges of rabbet of keel; and below these are shown, in succession, the lower edge of keel and the two pieces of false keel. The lines marked *UDL* in the sheer plan are, beginning at the uppermost, the lines of upper side of upper deck at middle line, upper side of upper deck beams at middle line, and upper side of upper deck beams at the ship's side respectively; these being usually known as deck at middle, beam at middle, and beam at sidelines. The vertical distance between the first and second is, of course, the thickness of deck plank; that between the second and third is the round up of the beam—it is at once seen that the latter meet at the extremities of the deck. Besides the lines just noticed, there are also shown the knee of head, head rails, stern and munions, ports, masts and other details.

Conventional Usage is Adopted

The upper edge of rabbet of keel is selected as the base line of the sheer draft shown in Fig. 4. This is a conventional usage which is adopted when, as in the present instance, the joints of the frames are perpendicular to the keel. Before passing on, it should be stated that the line termed the upper edge of rabbet, which is usually chosen as a

base line, is incorrectly named, being merely a line parallel to the lower edge of rabbet—a fixed line—and distant from it the thickness of the bottom plank. By making this the base line, and the ship not being on an even keel, causes the water lines to be curved in the body plan as shown. In many cases the frames stand perpendicular to the *LWL*, and in such cases a line drawn parallel to the latter, and near the keel, has been chosen as a base, thus causing the square stations in the body plan to end successively one below the other, as shown by Fig. 5 in the next installment instead of mostly at a point, as in Fig. 4 and the water lines in such drawings are known as level lines.

Fairing the Ship

The sheer draft is usually prepared on a scale of $\frac{1}{4}$ inch to a foot. This is copied full size upon the mold loft floor, in performing which operation it is found that errors, almost inappreciable in the one-quarter scale drawing, become very apparent when thus magnified 48 times. The three plans which, when upon paper, coincide as nearly as the draftsman's powers will permit, when copied to full size are found to disagree sufficiently to prevent the various problems of laying off from being solved with that degree of accuracy which is necessary in order to obtain a fair surface to the ship. Hence a fairing, or correcting process has to be performed before the timbers can be laid off.

The mutual dependence of the three plans upon each other has already been shown; this property is utilized in performing a tentative process termed fairing the body. It has been shown that the projections of each of the sets of lines generally used in this process, viz., level lines, square stations, bow lines, and diagonal lines, appear straight in one or two of the plans; so that, by the aid of a straight-edged batten, they can be drawn fair very readily in such plans. The property which a wooden or metallic batten has of bending in a fair curve, is brought to our aid in drawing the lines fairly in the plans where they appear curved. For, since the intersections of lines with each other are points, the points of intersection of two sets of lines in one plan are transferred to their relative positions in others, so that points which, when in one plan, were in a straight line, are now in a curved line; a batten is penned, or bent to pass through as many of the points as is consistent with absolute fairness, and the line is drawn. Thus,

by a series of interchanges, the various lines are copied from one plan into another, until at length all the plans coincide, the lines composing them are continuous curves; and, having thus evidence of a continuous surface, the body is said to be fair. We will now go through these operations in detail, commencing by copying the drawing upon the floor.

It is a great advantage if the seams of the boards forming the floor of a mold loft are perfectly straight and parallel, as they thus afford considerable assistance in the several processes of squaring and drawing parallel lines which are involved in the practice of laying off.

Striking the Base Line

The first thing to be done is to strike a base line on the floor; if the board edges are arranged as just stated, it will be necessary to place the base line either parallel or perpendicular to the lines of the seams. Should the floor be rectangular, about two feet from the wall or other boundary of the floor is a very convenient position for a base line. As before stated, a line parallel to the lower edge of rabbet is usually taken as the base, except in the case already cited. Whichever line, however, is chosen, the depth of the keel, the lower edge of rabbet, and the upper side of keel, are set off from it, at distances measured from the sheer draft; also, the fore and after edges of stem, together with the fore edge of rabbet of stem, which latter is, of course, a continuation of the lower edge of rabbet of keel. The post is next copied with the after edge of its rabbet, also the margin of stern and the various square stations in the sheer plan, including the fore and after perpendiculars. These, with the beam at middle lines, are termed the fixed lines of the sheer plan, being indeed unalterable, except insofar as drawing them fair is concerned. To economize space, the half-breadth plan is generally drawn upon the same part of the floor as the sheer plan, the base line of the former, or a line parallel thereto, serving as the middle line of the latter, and in this way the same square stations will do for the two plans. There are few mold-loft floors upon which vessels of more than 100 feet long can be drawn in one length to full size; hence it is necessary to lay them off in two, three, and, in some cases, even more parts. The usual practice, with a wooden ship, is to set off the two perpendiculars at such distances from the ends of the floor, as will permit of the head rails and stern timbers being laid off; where as with an iron

ship, the perpendiculars can be so placed as to just give room for drawing the contour of the stem and the rake of the counter.

When the positions of the perpendiculars are fixed, as much of the fore and after bodies are drawn as the length of the floor will allow, and if there still remains an amidship part, it is laid off separately; so that there are two, or even three, sets of lines overlapping each other. However, since these bodies are not both laid off simultaneously, no confusion occurs.

We will presume that there is room upon our floor to lay off our ship in two parts, and will consider first the fore body, *i. e.*, that portion of the ship on the fore side of dead flat.

Having already copied the sheer plan, we will now copy the body plan, doing so as near as possible to the former, at the same time not allowing the lines to cross if it can be avoided. However, this is a mere question of room and convenience. On a small floor the same base line may well serve for the three plans, one of the square stations at amidships being taken as the middle line of the body plan.

A base and middle line for the body plan having been drawn upon the floor, before copying that plan it will be necessary to put certain additional lines in the body plan of the sheer draft, in order to assist the draftsman in copying, and subsequently fairing it. By reference to the sheer draft shown in Fig. 4, it will be seen that the water lines are curved on the body plan. Now the process of fairing is materially assisted if lines which are curved in one plan are straight in another. We have already explained the cause of the curvature of these water lines when projected upon the body plane; we will now draw a series of lines parallel to the base line of the sheer plan, and equidistant from each other. These lines, being produced by the intersections of the surface with planes parallel to the horizontal or half-breadth plane, will appear straight in the body plan, and will, in fact, be drawn similarly to those in the sheer plan. We will, therefore, draw in the body and sheer plans about as many of those level lines as there were water lines, and copy the lines upon the floor; besides which we will put in level lines near the top side line, top breadth line, and at other intermediate positions, according to the height of the ship above the load water line.

Besides these, in order to obtain more numerous and better intersec-

tions, a number of diagonal lines are drawn in the body plan. The positions of these lines will be given hereafter; suffice it to say, for the present, that they are the lines of the heads and heels of the timbers, and therefore of the harpins and sir-marks.

Having transferred these lines to the floor, we proceed to copy the body plan by measuring, with a scale, the distances, along the several level and diagonal lines, from the middle line to where they cut the square stations, and then setting off these distances to full size on the corresponding lines upon the floor. Bat-tens are then penned or bent, so as to approximate as closely to these points as is consistent with absolute fairness or continuity, and the lines are marked in with thin slices of chalk.

Table of Ordinates

At some yards it is customary to measure these ordinates, etc., and record them upon paper in a tabulated form before proceeding to draw the body to full size on the floor; and thus the latter operation is performed without direct reference to the drawing when working on the floor. The square stations thus drawn upon the floor are ended as follows: The lines of the half sidings of keel, stem, and sternpost, are drawn in the body and half-breadth plans from dimensions furnished by the specifications or scheme of scantlings, which also states the taper, if any, which these parts of the ship should have. Next, the distance from the base line of sheer at which each square station cuts the lower or fore edge of rabbet, is set off from the base line of body upon the middle line of that plan, and from this point a line is squared out to the half siding of keel, stem, or sternpost. A circle is then swept with the point thus obtained as a center, and a radius equal to the thickness of the bottom plank, and the square station is ended as a tangent to this circle upon the side of the latter, which is nearest to the middle line of body. It should be noticed that this ending is approximate.

The Standard Shipbuilding Co., Vancouver, B. C., recently closed contracts with Sir Joseph McClay, head of the imperial shipping board of Canada, for 10 composite steamers. It intends to build a plant at Ruskin, B. C., near the junction of the Stave and Frazer rivers. Patrick J. Donohue, naval architect, is to be the superintendent.

Late Decisions in Maritime Law

Legal Tips For Ship Owners and Officers

Specially Compiled for The Marine Review

By Harry Bowne Skillman

Attorney at Law

THE facts set out in the case of the SAHARA, 246 *Federal Reporter* 141, show that the British steamship SAHARA, worth not less than \$400,000, stranded upon the Atlantic coast off Virginia, near Ship Shoal inlet, and accepted the assistance tendered by a powerful wrecking tug worth a great deal more than \$100,000, which is kept ready for such service. Two attempts to get the SAHARA off were made about five hours apart, the second being successful after a half hour, when the SAHARA came off without using her own engines. The weather was good and the ship was in no immediate danger and her own engines might have got her off, or she might have been pulled off by some passing vessel. The court made a salvage award of \$12,500, and said, in speaking of the wrecking tug: "The public interest requires the maintenance of such vessels, and to maintain them it is necessary that they shall be liberally compensated when they do successful salvage work."

In the case of the KIA ORA, 246 *Federal Reporter* 143, which cites the above case of the SAHARA, an award of \$100,000 was made, it appearing that the grounded vessel was worth from \$1,800,000 to \$3,000,000, that her cargo was valued at \$2,500,000, and that the wrecking steamer, built especially for such service, cost \$450,000. The court said, in connection with basing the award upon a percentage of the value of the property salvaged: "While ordinarily the percentage rule, merely as fixing the basis of allowance, should not be adopted, particularly in cases of large salvaged values, as here, the amount of the allowance, as thus arrived at, cannot be lost sight of in fixing compensation, nor that such percentage ran as shown by adjudged cases * * * from 3 to 85 per cent of the value of the property salvaged, depending upon the special circumstances; the cases, however, in which a greater award than 50 per cent was made, being rare." Speaking further, the court said: "The real end sought to be reached, regardless of the method of ascertainment adopted, is: What would be a fair and reasonable allowance for the services rendered, having in view all the circumstances of the same, together with such a sum as would be necessary to give encouragement and stimulus to salvage operations, in order that the most effective assistance to shipping overtaken by distress at sea may be secured? An award in the nature of a bounty to the salvor, in the interest of the public and commerce, is well recognized, in order that encouragement may be given to those engaged in maritime commerce, to look out for those in distress; and the fact that those, like the libellant, who

make the saving of ships a business, should be taken into consideration in making such awards. * * * They expend large sums of money in maintaining plants with valuable wrecking vessels with expensive outfits, manned and operated by most experienced and competent crews, and as a consequence are enabled to render prompt, efficient and peculiar services, that would be impossible for ordinary vessels, not thus equipped, to do."

The master of a vessel has no authority to alter the contract made by a charter party. The charter party as executed, in the absence of fraud or of mutual mistake, determines the rights of the parties.—Patagonia Steamship Co., Ltd., v. Gans Steamship Line, 243 *Federal Reporter* 532.

Libellants, in the case of Foreman v. J. M. Benas & Co., 247 *Federal Reporter* 133, signed articles for a voyage on an American vessel from New York to London, and to such other ports in Europe, "including war zone", as the master might direct, and back to a final port of discharge in United States, north of Cape Hatteras. The vessel was torpedoed by Germans in March, 1917, apparently in the war zone. It was claimed that respondent represented that in case of any disaster the libellants would be paid their wages up to the date of their arrival back to the port of shipment, and it was alleged that the vessel carried contraband, and suit was brought for wages from date of destruction of vessel to their arrival in the United States. It was held that if the representations were made before the articles were signed, they are merged in the articles; and if made later they were of no effect, because without consideration. Neither deception as to contents of the articles was alleged, nor failure to read the same to the seamen pursuant to law. Under such circumstances oral promises can have no legal effect. It was further decided that the carrying of contraband did not increase the legal risk if the ship was sunk in the war zone, the court saying: "The proclamation of the imperial government as to the 'war zone', and the subsequent proclamation limiting the number per week and defining the permissible route of American vessels, rendered every American vessel engaged in European trade, which was not armed, or under convoy, exposed to daily risk of destruction by German submarines. This was particularly so after the severance of diplomatic relations. I think it is ignoring the substance of things to regard the carrying of contraband without notice to the seamen, where the articles provided for passage through the war zone, as a material variation

of the libellants' contract. The torpedoing of the vessel was in my opinion a loss which terminated the voyage, and entitled the libellants, under section 4526 of the Revised Statutes (Comp. St. 1916, §8317), only to wages prior to that event."

The general maritime law does not give a lien on a vessel for an alleged breach of contract by failing to proceed to the designated berth for loading, it was held in SATURNUS, reported in 242 *Federal Reporter* 173.

The right to a lien upon a vessel for repairs, supplies, and other necessities, was in issue in the case of SOUTH COAST, 247 *Federal Reporter* 84, and in connection with procuring them on credit the court said: "It seems to be settled law that, unless repairs and supplies are necessary to render the vessel seaworthy to enable her to proceed on her voyage, the master is not authorized, as between himself and the owners, to procure them on the credit either of the owners or of the vessel. But the necessity for credit will be presumed where it appears that the repairs and supplies were ordered by the master, and that they were then necessary for the ship when lying in port, or to fit her for an intended voyage, unless it be shown that the master had funds, or that the owners had sufficient credit, and the repairer, furnisher or lender knew those facts, or one of them, or that such facts and circumstances were known to him as were sufficient to put him upon inquiry, and to show that if he had used due diligence he would have ascertained that the master was not authorized to obtain any such relief upon the credit of the vessel."

"It is well settled, upon just principles, that as between two sets of salvors, if it appears that the claim of a set of salvors to a share in the salvage reward is based upon the dispossession, against their will, of other persons who were at the time continuously engaged in salvaging the vessel in distress, and who were willing themselves to persevere in the service which they had begun, the court allows the claim only, if it is clearly proved that the first salvors had not any fair prospect of success. In the absence of such proof, the burden of which lies upon the second set of alleged salvors, the court holds the dispossession to be wrongful, and treats the subsequent service rendered by the wrongdoers as inuring wholly to the benefit of those who have been dispossessed, and not as entitling the wrongdoers to any share in the salvage award."—EDILIO, 246 *Federal Reporter* 470.

How Inland Ships Were Sent to Sea

Lake Vessels Were Fitted Out for Ocean Service in Record Breaking Time—Work Successfully Carried on in Midwinter Despite Hardships

By Frederic T. Turner

THE story of how 16 Great Lakes steamers were cut in two in Buffalo and put together during the past winter at Montreal and Quebec, and of how 10 big lake tugs were refitted, and the 26 craft sent into salt water service for Uncle Sam, forms as inspiring a chapter of practical patriotism as has ever been written into the history of the American merchant marine.

It is a story of a big job splendidly conceived and successfully carried out at a heartbreaking pace by private corporations and difficulties were not entirely eliminated by the fact that Uncle Sam stood ready with a helping hand, because the hand that did the helping also held a stop watch.

The cutting and bulkheading job at Buffalo was done by the Buffalo Dry Dock Co., while the task of nursing the dismembered sterns and bows through the lakes to Montreal, fitting with freshwater tanks and condensers—all without benefit of dry-dock, fell principally to the lot of the Lake Shipbuilding Co., Buffalo.

Job to be Repeated

The entire work was done between Oct. 6 and Jan. 28, and done so well that the government has called on the Buffalo organizations to repeat the job on another fleet of Great Lakes ships again this year.

The new contract is going to be easier to carry out than the first one. Montreal, in summer, will be a lot different than Montreal in January.

The first bow to get into Montreal last fall was that of the AMERICA. Her stern came lumbering along soon afterward and 300 huskies, the cream of Buffalo and South Chicago yards, who had been transported in special cars to the Canadian port, went to work immediately. By the time the NORTHERN QUEEN—the second ship in—arrived, the gangs had worked into the hang of it and they fairly hustled the ship together.

Bringing the two ends of a vessel into adjustment for riveting together is an operation calling for considerable skill and careful maneuvering, but it was carried out with an ease and swiftness which showed how carefully the work had been planned beforehand. The ends of the vessel were lowered or raised, as

occasion required, by water ballast. When in the correct position, the sections were bolted together by means of lugs, the holes for which were drilled be-

A Woman Shipmaster

ITALY claims the distinction of having a woman now officially listed among her navigators. Miss Elise Belluomini, a young woman of Viareggio, Italy, has been presented with a first-class master's license, having successfully completed all her examinations. Born and bred among a seafaring folk, Miss Belluomini developed in early life an ardent desire to follow the sea for a career. Upon imparting her ambition to her friends and relatives, she was ridiculed, and urged to abandon an idea which to them seemed both unconventional and preposterous.

Apparently, however, the young woman was not to be swayed or discouraged in carrying out the ambition which she had outlined for herself for a few months later found her, by special decree, taking a course in the nautical institute at Viareggio. The ease and facility with which she mastered the nautical problems submitted to her won her the respect and admiration of her fellow students who aided her wherever possible.

After she had completed her course at the nautical institute, she was refused admittance into the Mariners' union, which was unwilling to break its traditional policy by admitting a woman to membership. The girl's perseverance finally triumphed over this, too, the last difficulty, with the result that she has finally received the coveted license.

fore the vessels were cut apart. This guaranteed a good fit.

Divers went below on the outside and pushed the bolts through the holes while men on the inside screwed nuts in position. Then a broad steel strap was placed around the outside of the cut, the sides being riveted and the portion below the water line and around the bottom of the vessel being bolted. The work under water was, of course,

done by divers of long experience.

As this was being done, the company's two machine scows, the Ox and the BULL, attacked the port and starboard sides of the vessel, and swarms of riveters shot in the red-hot rivets and gradually drew the two sections into one. Oxyacetylene flame men completed the work by welding all cracks and crevices. In six days the NORTHERN QUEEN had been joined together and, in four days more, repiped, refitted with fresh water tanks and with a condenser, she swung out into the stream with a Cape Cod crew in control.

But it wasn't all easy sailing. The parts didn't all arrive on schedule, and when this happened a hurricane of blue flashes would be aroused in the dock office and hot telegraphing would ensue.

The lock tender at Port Dalhousie would be routed up for this:

"Has stern of CODORUS left Dalhousie? Where is she?"

And then the reply: "Yes; I don't know."

Sterns and bows were awaited with alternate hope and despair, but they all got in somehow, though as the winter came on, they made harder and harder weather of it. "Somewhere on Lake Ontario" became as familiar a term to the men at Montreal and Buffalo as "somewhere in France" has to the world.

Men Work Under Difficulties

Hardships came when the workers found themselves gripped by an old-fashioned Canadian winter, a little ahead of schedule. It was then a case of the men working in hip boots in waist-deep water with their bare hands and arms almost constantly wet. Divers who were snug enough under water, suffered miserably when they came on deck to take off their helmets in zero temperatures—minus 12 it was part of the time in December. But it was up to the gangs to stick and they did. They took six hours' sleep and worked the other 18—that is from 6 a. m. till 12 p. m. They rolled into the lodging houses and rolled into bed with their clothes on, snatching rest as they could. They kept up their drive every minute, even at Christmas time when loneliness and homesickness threatened to dispell thought of \$200 pay checks for seven days' of unremittent work.

When ice threatened to sew up activities at Montreal, early in December, the whole plant was moved to Quebec, where most of the work on the tugs was done. The work halted for nothing, not even to recover valuable tools that went overboard. About \$5000 worth were lost.

Frank P. Ranahan, president of the Lake Shipbuilding Co., gave his personal attention to the work first; later, Frank E. Trautman, vice president, was in charge. The job was blessed with half a dozen men who knew how to handle rush jobs, including Dan Ranahan of South Chicago; John Provencher, William McFadden, George Perry and John Hanson of Buffalo.

They knew how to meet emergencies. On one occasion a tide-

water man could not see the necessity of moving out to make room. He foamed at the mouth when Hanson and Perry led a gang of huskies aboard at the direct instance of a United States inspector supervising the work. Hanson and his men leaped into the engine room and Perry took the wheel. Interference with Hanson, Perry, U. S. & Co. would have been dangerous.

Job is Finished at Last

So the work went on and late January found the harbor clear, one after another of the ships having recovered herself and steamed east. Among the cargo carriers handled by the Buffalo company at Victoria pier and Sunderland dock, Montreal, were the AMERICA, NORTHERN QUEEN, NORTHERN

LIGHT, NORTHERN KING, NORTH WIND, NORTHERN WAVE, TUSCARORA, BETHLEHEM, CODORUS, GEORGE N. ORR, GERMAN and BRITON. The SENECA, MAHONING, MINNESOTA and SARANAC were handled at the Vickers drydock, Montreal, while the Lake company refitted the tugs FAVORITE, AMERICAN, SCHENK, FITZGERALD, EDNA G., KENTUCKY, MANITOWOC, GOULDER, McCARTY and JOHN MEYERS, at Montreal and Quebec.

This summer the same outfit will grapple an even larger fleet of lake vessels which are to be treated similarly. To obviate the difficulty of finding board and quarters for the men, the government will send to Montreal a Lake Michigan passenger boat with 200 cabins and a big galley with all tables, linen, dishes and tableware complete.

Boston Gets New Embarkation Plant

A \$20,000,000 overseas embarkation plant at the port of Boston, practically decided on by the government, will be the largest construction task undertaken by the war department with the single exception of the army cantonments.

The chief warehouses and docks will be located on the reserved channel, South Boston, on land now owned by the state. The development will include an 8-story concrete structure, said to be the largest in the world, and a 2-story dock to run parallel with the great warehouse. Plans call for a freight classification yard enlarged from present trackage of the New York, New Haven & Hartford railroad.

The war department's decision to utilize the port facilities of Boston

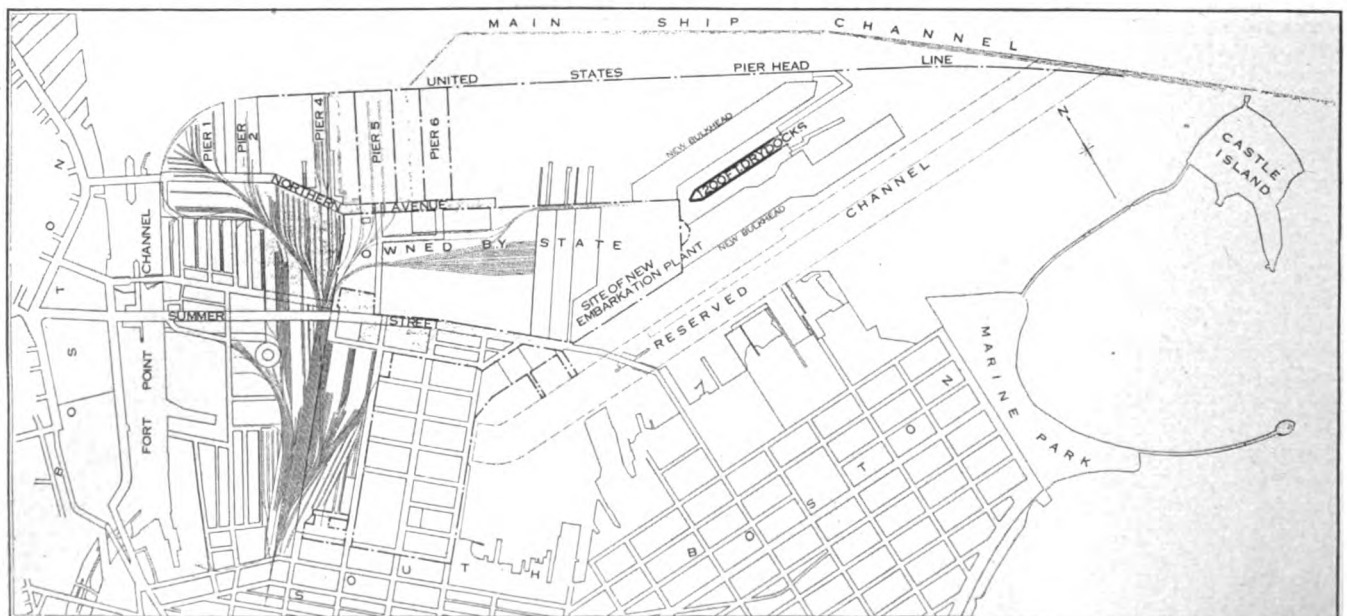
may be attributed to Maj. Gen. George W. Goethals, whose plans are in charge of Colonel Gunby, chief of the cantonment division. Selection of Boston was made after it had been shown that the New York port equipment would be inadequate to handle all New England-made war supplies. A considerable number of troops also may be handled from Boston.

The state has spent about \$8,000,000 on improvements and reclaimed 10,000,000 feet of land in the locality where the government plant is to be built. At the present time a monster drydock, 1200 feet long, is nearing completion and the federal government has guaranteed a minimum rental of \$50,000 for its use.

As now planned, the concrete warehouse and other necessary structures

will be adjacent to the drydock and on the reserved channel, as shown in the accompanying illustration. This channel leads from the main ship channel to land owned by the state and it has ample depth at low tide. Sea walls and bulkheads are already in place.

In the immediate vicinity of the proposed government warehouse are located the so-called commonwealth piers. Pier No. 5 is 1200 feet long, 400 feet wide and has 40 feet of water in the berths alongside. The entire pier is covered with a 2-story shed. Railroad tracks run the length of the pier. Pier No. 6, which is practically the same size as Pier No. 5, is leased to the Boston Fish Market Corp.



LOCATION OF NEW EMBARKATION PLANT AT BOSTON

Marine News in a Personal Way

Intimate Gossip About What Leaders in the
Maritime World Are Doing

COL. HENRY P. BOPE has resigned as vice president and general manager of sales of the Carnegie Steel Co. to devote his time to private interests. He became connected with Carnegie Bros. & Co. in November, 1879, and had remained continuously in the sales work of that company and its successors up to the present time. He has been succeeded in his office with the Carnegie Steel Co. by William G. Clyde, who has been assistant general manager of sales in charge of the bureau of bars and hoops. Charles L. Wood, who has been assistant to Mr. Clyde has been made assistant general manager of sales.

CHARLES E. DOWNTON has been made superintendent of labor at the plant of the Atlantic Shipbuilding Co., Portsmouth, N. H., having resigned a similar position with the New England Westinghouse Co., Chicopee, Mass.

D. M. CALLIS, who was chief inspector of steel ship construction in the northwest district for the Emergency Fleet corporation, has been promoted to assistant northwest district officer. He succeeds C. H. Hamilton who resigned recently.

J. B. DENISON, formerly assistant to H. H. Raymond, president of the Mallory and Clyde steamship companies, has been made vice president of both lines.

WILLIAM J. MAHONEY, chief accountant of the Gaston, Williams & Wigmore Steamship Corp., has been "commandeered" by Auditor Wilcox of the shipping board. He will serve as a government accountant.

A. F. HAINES, Seattle, general manager of the Pacific Steamship Co., recently accepted an offer to preside as chairman of the water transportation section at the annual convention of the International Association of Rotary clubs to be held in Kansas City, Mo., the week of June 23.

EMERSON J. GRIFFITHS, Seattle, who is associated with the Pacific Steamship Co., has been appointed northwest agent of the sea service bureau of the United States shipping board. Mr. Griffith will

have jurisdiction over Washington and Oregon.

JAMES FORBES, formerly with the Manitowoc Shipbuilding Co., Manitowoc, Wis., has been made general manager of the Interlake Engineering Co., Cleveland. Mr. Forbes succeeds Thomas Deegan who has become associated with the Ohio Shipbuilding Co., Cleveland.

RAYMOND E. BROWN, contracting engineer, has recently opened an office in New York for Heyl & Patterson, Inc., Pittsburgh, builder of cranes.

GASTON DE TELLERIN DE LA TOUCHE has been elected president of the French Steamship line, to succeed the late Jule Roux. M. de la Touche is a commander of the Legion of Honor and is well known in shipping and financial circles on both sides of the Atlantic.

CAPT. ALEX CUNNING, wrecking master of the Great Lakes Towing Co., returned recently from Prince Edward island where he examined the wrecked steamers GEORGE N. ORR and CODORUS.

WALTER M. WILLIAMS, Cleveland, has been appointed agent of the division of operation of the Emergency Fleet corporation. He is charged with the duty of moving to sea the ships built in the ninth district for the corporation.

HOWARD J. GRIFFIN, who for the past year has been Chicago district manager for the Milwaukee Electric Crane & Mfg. Co., Milwaukee, has been appointed district manager of the Pittsburgh office, effective May 1. Mr. Griffin previously was associated with the Allis-Chalmers Mfg. Co., Milwaukee, for 15 years.

WILBUR G. HUDSON has been recently appointed district supervisor of the division of wood ship construction, Emergency Fleet corporation, with headquarters at 115 Broadway, New York City. Mr. Hudson's district embraces the states of New York, Connecticut, New Jersey and Pennsylvania.

C. W. COOK, San Francisco, appointed director of operations for the shipping board on the Pacific coast,

will have charge of both building and operations for the entire Pacific seaboard. Mr. Cook has been Pacific coast manager for the American-Hawaiian Steamship Line. As director of operations for the west, he will have charge of branch offices established by the shipping board in Pacific ports.

B. F. MCCREARY has become a member of the sales force of J. K. Larkin & Co., New York. He formerly was in the sales department of the Republic Iron & Steel Co., and later in charge of sales for the Matlack Coal & Iron Corp., New York.

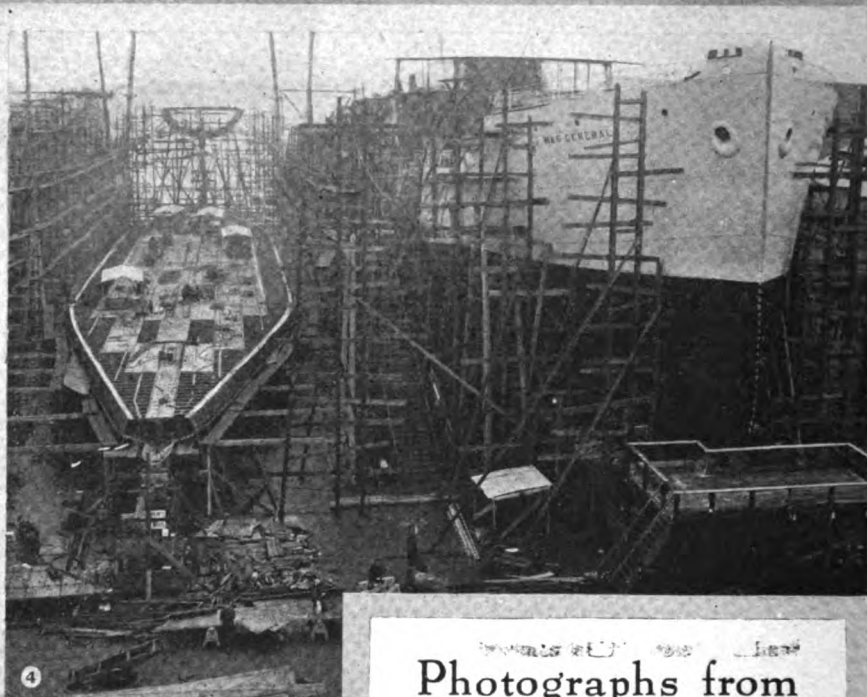
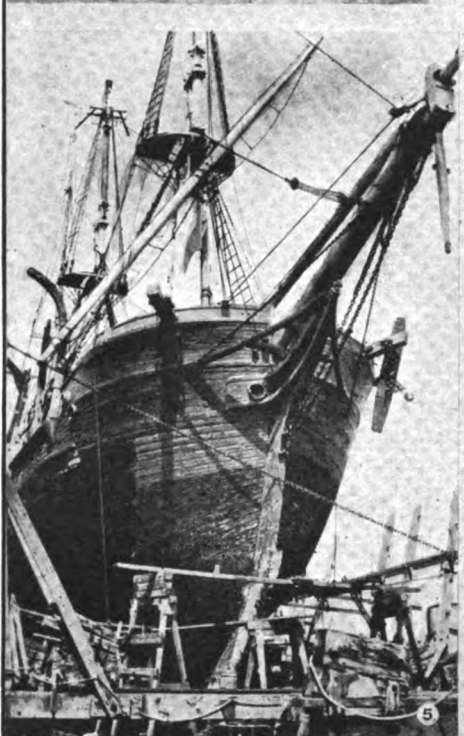
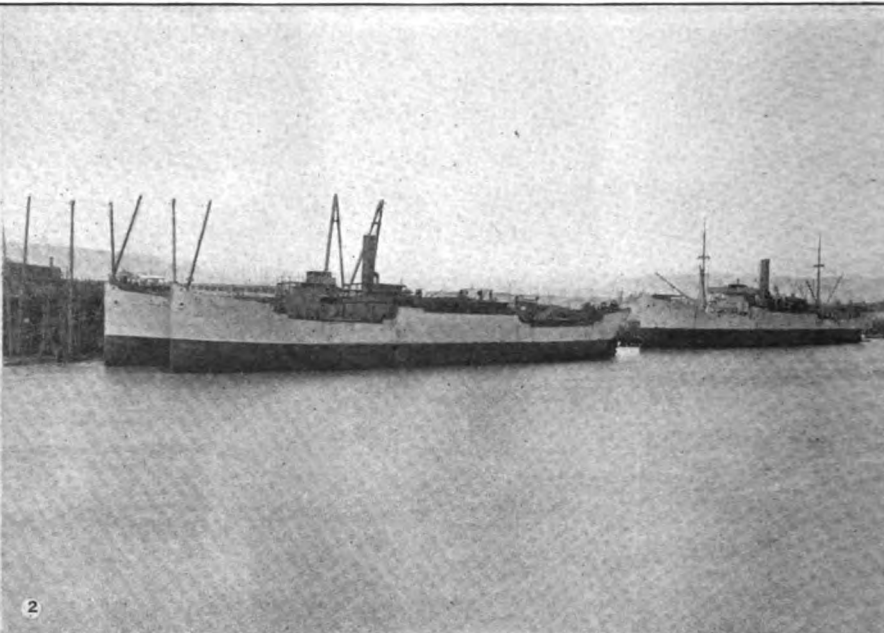
FRANK BARTHOLOMEW, who has been erecting engineer for the Shaw Electric Crane Co. for the past 20 years and who resigned his position with that company in December, 1917, has become associated with N. B. Payne, 25 Church street, New York, specialist in electric cranes.

R. S. COOPER was recently elected vice president and general sales manager of the Independent Pneumatic Tool Co., Chicago. Until recently he was the company's New York representative.

CHARLES S. CALDWELL has been elected president of the Schutte & Koerting Co., Philadelphia, the stock of which was recently taken over by the alien property custodian of the United States. A new board of directors was formed, of which Mr. Caldwell is chairman. The other members are: D. W. Hildreth, treasurer; Ralph J. Baker, secretary; E. Pusey Passmore and T. H. Johnson, all of Philadelphia. The board announces that the company's business will continue to its fullest capacity in all its lines.

R. H. LAVERIE, chief surveyor of the Bureau Veritas, France, for the United States, recently inspected the shipyards at Seattle in company with Frank Walker, Puget sound representative of the French government.

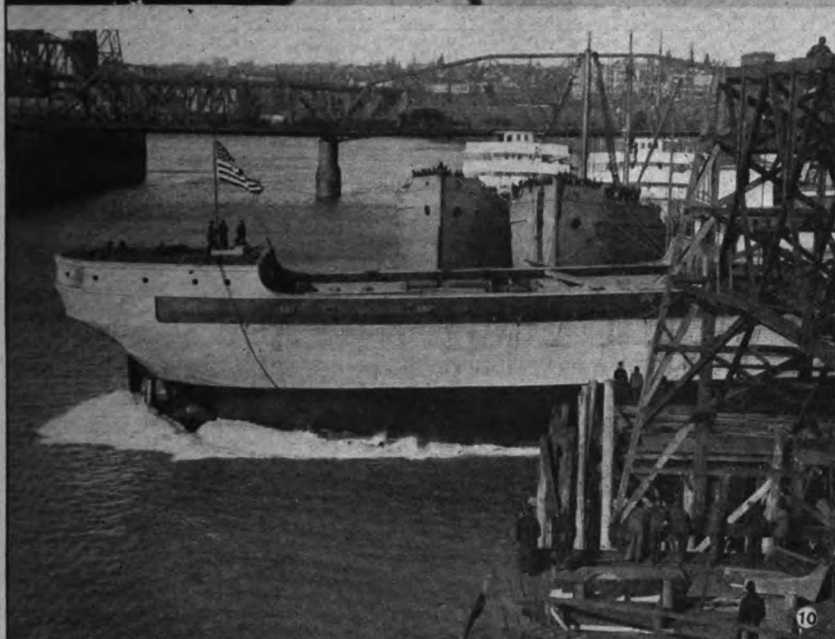
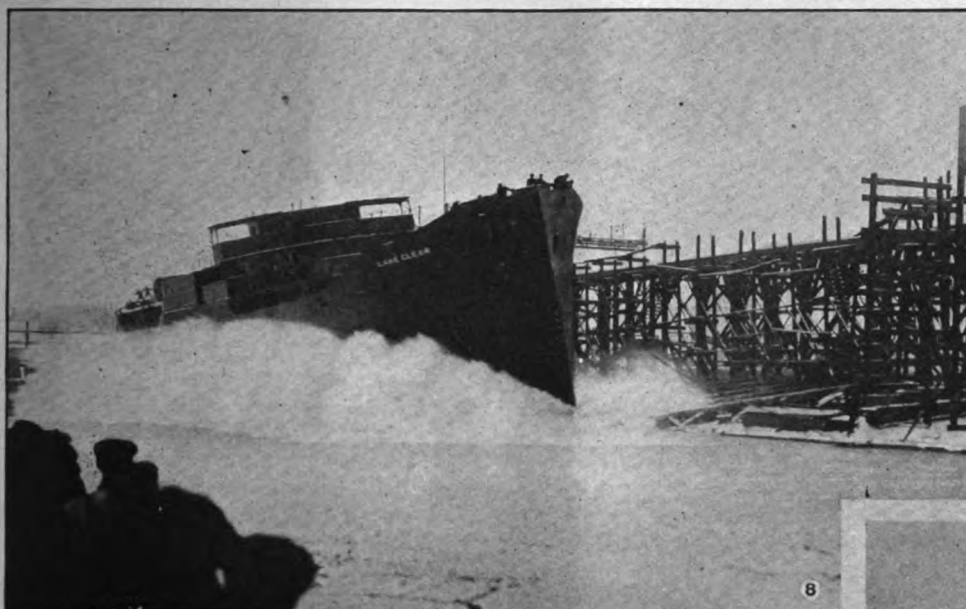
CAPT. O. A. JOHNSON, a veteran mariner of Seattle and president of the Shipmaster's Association of the United States, has been elected president and general manager of the new Western Shipbuilding Co., Antioch, Cal.



Photographs from Far and Near

Fig. 1.—Lord William James Pirrie, newly appointed British director of shipbuilding. Fig. 2.—Steel cargo ships built at Seattle. Fig. 3.—First wooden ship built at Fort William, Ont. Fig. 4.—Shipyard scene at Seattle. Fig. 5.—Seventy-two-year-old whaling bark CHARLES W. MORGAN refitting for a voyage. Fig. 6.—FAITH, the largest concrete ship ever built. Fig. 7.—Sunday afternoon on a Great Lakes barge—one of the crew furnishing music.

Fig. 1 copyright by Press Illus. Ser.



Late Marine News in Pictures

Fig. 8—Launching the LAKE CLEAR to Chicago. Fig. 9—Catching the mail boat at Detroit. Fig. 10—Launching the wooden steamer HARNLEY at Portland, Oreg. Fig. 11—Mrs. Myrtle R. Hazard, Baltimore, the only woman electrician in the United States coast guard, and one of the few women radio operators in the government service. Fig. 12—Typical gulf oyster schooner and crew, sailing from Biloxi, Miss.

Fig. 11 copyright by Harris & Young. Fig. 12 copyright by Press Illus. Ser.



Finding Crews for Big New Fleet

In the Face of Present Labor Shortage, Lake Vessel Operators Expect
to Find Men in a Few Weeks Time for Hundreds of Ships Now Idle

By Fred B. Jacobs

THE fleet of 400 vessels operated by the members of the Lake Carriers' association carry much of the commerce of the Great Lakes. Each vessel carries a crew of approximately 28 men, so that about 11,200 men are continuously employed. As the lakes are open to navigation only from seven to nine months out of the year, shipowners must recruit their crews every spring and disband them every fall. To the layman, the task of promptly finding crews for these vessels every spring no doubt seems an almost hopeless one but in reality, it has always been accomplished with but little delay. Today with a shortage of men confronting every industry and the war's demands constantly accelerating the scarcity, the men who must find the crews for the lake boats—now getting ready for service—are confident of success.

Keeps in Touch With Men

While the Lake Carriers' association does not hire men directly it co-operates with the masters and engineers of the vessels in obtaining crews, and were it not for this fact vessels would continuously risk delays from want of crews. In all the principal lake ports the association has a commissioner whose duty it is to keep in touch with officers, seamen, engineers, oilers and

others and to find them ships when they wish to sign on. The association maintains rooms in every port which are fitted out for the comfort of men who are looking for a chance to ship. These rooms are provided with up-to-date reading matter, writing materials, etc., so that the men have the opportunity to spend their time in excellent surroundings while looking for a ship.

The Call of the Sea

*To hear the call of the great
beyond,
Where the winds of adventure
blow,
To follow the god of the wander-
lust,
Beyond the horizon low.
This is the life that calls to youth,
On the spring's first balmy day,
A carefree life on the roaring sea,
From the city's din away.*

Let it be assumed that Pete Harris is an oiler who is looking for a chance to sign on for a voyage. He calls on the commissioner at Cleveland. The majority of lake sailors have one peculiarity in that they prefer always to sign on at the same port. Now Pete may have left his last ship at Buffalo

but when he is ready to sign on for another voyage he will railroad to Cleveland if that port happens to be his favorite one. For that reason, Pete has shipped from Cleveland many times and the commissioner knows him.

"Hello, Pete," he says by way of greeting, "looking for a ship?"

"Sure thing, think you can find me a berth?"

"Certainly. Let's see you are an oiler aren't you and also a machinist by trade. Now stick around here and I'll see what I can do."

Perhaps a half hour later the telephone rings. An assistant engineer is looking for an oiler.

"I have just the man you want," the commissioner says, "he's right here now. An experienced hand and a machinist as well."

"All right," the engineer replies, "send him down."

So Pete goes aboard the vessel and asks for the engineer. In a short talk, the engineer learns that Pete is a good hand and the ship's articles are signed. If his work is satisfactory he may sail on the same vessel until the close of navigation the following fall and, again, he may leave the vessel after a few voyages for the lake sailor, like the salt-water man, often likes to change.

Green Men Are Trained Readily

A large number of green men are shipped every season. Where they come from no one knows. They just come, that is all there is to it, is the favorite explanation. The call to wander is strong within them and the romance of a sailor's life appeals to them. While a young man may know absolutely nothing about the water, if he is sober and industrious, does his work well, and makes an effort to learn, he receives good treatment and cordial assistance and in time becomes an experienced seaman or engineer as the case may be. The association conducts engineering and navigation schools during the winter months where ambitious men have a chance to study the subjects that appeal to them and thus fit themselves for steady promotion.

One reason why the lake freighters are always supplied with plenty of men is that the living conditions afforded them are excellent—much better in fact than those generally found on salt water. Again, the life of the lake



LAKE SEAMEN WHO WISH TO BECOME OFFICERS ARE GIVEN FREE INSTRUCTION IN THESE EVENING CLASSES.

sailor is more democratic. On the lakes, lake conditions are excellent, the crews have comfortable quarters in the after house, clean bunks to sleep in and a light and airy mess room to eat in. The lake sailor, as well as the firemen and coal passers, eats from a clean table cloth and has some one to wait on him. His quarters are clean and he has the privilege of taking a shower bath any time he feels like it. Thus the life aboard ship appeals to intelligent men. The crew of a lake freighter is largely made up of native Americans who come from the middle west. Wages paid to lake sailors and officers are much higher than those paid at sea and the men are given the incentive to save their money. The captain always pays off. He might say to one of the crew, "Jim, you've got \$96 coming to you. How much of it do you want?" "Ten dollars will be enough" Jim might reply. The captain gives Jim \$10 and saves the remainder. Thus at the end of the season Jim is quite likely to have a big pay day coming to him. Thus the crew of the lake steamer *GRAND ISLAND* won first prize in a savings contest last year with a total of \$11,073.79. The crew of the *JOHN STANTON* had deposits amounting to \$7082.73 at the end of the season. Many lake sailors make enough in nine months to keep them for 12. In the winter they may work at a shore trade, go south for a vacation or loaf around home. All things considered, the lake sailor is well satisfied with his work. And for that reason the vessel owners find but little difficulty in shipping crews. As a matter of fact, the Lake Carriers' association has never found it necessary to advertise for men.

Many Trades Represented

In the fall of the year, however, it is sometimes hard to find men and the method employed is responsible for the fact that men of many trades become lake sailors. In a case where a vessel is short of men the commissioner sometimes sends a man in search of recruits. He may approach a man on the street. "Want a job?" he asks. "No," the man might reply, "I've got one." The next man may answer "yes." "All right, I can get you a fine job sailing on the lakes." "But," the man might protest, "I'm no sailor, I'm a stone mason." "That's all right," the commissioner assures him. "You can learn your duties quickly, will receive good wages with your board thrown in while you are learning. It's an ideal life." "I'll go you," the man replies in nine times out of ten. If a life on the water appeals to him, the man is a sailor from that time on.

This year the United States navy will place about 2400 young men on lake



THE FUNDAMENTALS OF A SAILOR'S CALLING ARE TAUGHT TO LARGE CLASSES DURING THE WINTER

boats with the object of giving them intensive training in actual sea duty. As labor of all kinds is at a premium at the present time the services of these men will aid materially in helping the lake vessels to carry full crews. "Does not the draft take a great many

is the old story, the call of the wanderlust in red-blooded Americans that will make it possible to man the lake boats this season. Just a few pleasant days, and a few long hoarse notes of steamship whistles and the men will begin to drop into the commissioners' rooms at all the lake ports, anxious to sign on for another season. If precedents count, it will not be a case of lack of men that the commissioners will have to contend with, but a question of keeping the men from becoming impatient until they can all be signed on.

How Seamen Are Found for Lake Vessels

IN no other field of maritime activity is there a condition parallel to the one which confronts the masters and engineers of Great Lakes' vessels in getting crews at the opening of the navigation season. As the lakes are open to navigation only a part of the year, the crews are disbanded every fall to be built up again the following spring. In the face of the present labor shortage, the task appears a difficult one. But lake operators are confident of having their ships fully manned, even though no special efforts are being made to recruit crews. The reason for this confidence and its justification is revealed in the accompanying article.

Treiber & Scheel, Seattle, naval architects, have consolidated and have opened offices at 903 L. C. Smith building for a general practice in naval architecture, specializing on wooden ships, representing owners building ships on the Pacific coast, maritime engineering and brokerage.

The Torcrete Shipbuilding Corp. has recently been incorporated at Dover, Del., with a capital stock of \$1,200,000 to build and operate boats made of concrete. The incorporators were William F. O'Keefe, George G. Steigler and J. H. Dowel, Wilmington, Del.

sailors from the lakes?" is a question that is often asked. Realizing the vital necessity of carrying on lake as well as ocean commerce uninterruptedly, the draft regulations place mariners in the fourth class, or otherwise the lake boats might be handicapped.

Operators of lake vessels expect to have no difficulty in finding plenty of sailors this season although no direct steps to get men have been taken. It

A new shipbuilding plan for private interests was approved recently. Chairman Hurley of the shipping board announced that the request of the Atlantic & Pacific Steamship Co. to place contracts with shipyards in Oregon for 150 motorships, each of 3000 tons, had been granted with certain restrictions. Officials of the board ascertained that the contracts will not interfere with the government program either in timbers or machinery.

American Ship Yard Activities

A Snappy Summary of the Leading Events of the Month in the
Vessel Construction Field

Shipping Board to Build Concrete Ships

THE successful launching of the concrete ship FAITH at Redwood City, Cal., March 14, has caused the United States shipping board to institute a new shipbuilding program providing for big concrete vessels more than twice the size of the FAITH. At a recent meeting of the shipping board careful consideration was given a report by R. J. Wig, chief of the division of concrete construction, on the launching of the FAITH, the performance of that vessel in the water and the investigations of this division on concrete ships in general. It was voted to begin at once the construction of three concrete ships of 7500 tons each. If these vessels prove a success, congress will be asked for a large appropriation for the building of concrete ships. Vessels of this kind can be turned out in quantities at a reduced preliminary expenditure for plant and equipment and without drawing on structural materials needed for steel and wood ships.

The builders of the FAITH have announced that they will begin the construction of 54 similar ships. Six weeks from the day the first concrete was poured into the forms the ship took the water. The vessel was launched sideways and the huge hull righted itself and rode on an even keel immediately. The launching was an entire success from an engineering point of view. The engineers declared themselves so well satisfied with the launching that it would be unnecessary, in their opinion, to give the vessel a towing tryout, as originally intended. Installation of the engines and other machinery was started at once, as the owners were anxious to put the vessel into commission as soon as possible.

The FAITH is 336 feet long and 45 feet beam. Her sides are 4 inches thick and she weighs approximately 3100 tons.

Her cargo capacity is 5500 tons. She has two decks and will be propelled by engines of 1500 horsepower. Three hatches are provided for stowing cargo. About 500 tons of steel reinforcing bars were used in constructing the vessel. The only wood used is in the officers' and crew's quarters, in the ceiling of planking on the inside of the hold and in the wooden planking on the lower deck.

The concrete ship department of the Emergency Fleet corporation followed the construction of the FAITH closely and is understood to be satisfied with the results obtained. R. J. Wig, chief of the concrete ship department, watched the launching of the FAITH and thoroughly inspected the vessel afterward. Mr. Wig stated that he had ceased to be a critic of the merits of the concrete ship and had become an advocate.

That a concrete ship compares favorably with a steel ship is the opinion held by experts of Lloyd's and by J. L. Bates and F. B. Webster, naval architects of the bureau of construction and repair of the navy department. These men are among the best authorities in the United States on ship stresses.

Vessels of concrete construction are not new. The first concrete craft was built in France in 1849. The process of construction was patented and the boat, which was only a small one, was exhibited at the world's fair held in Paris in 1855.

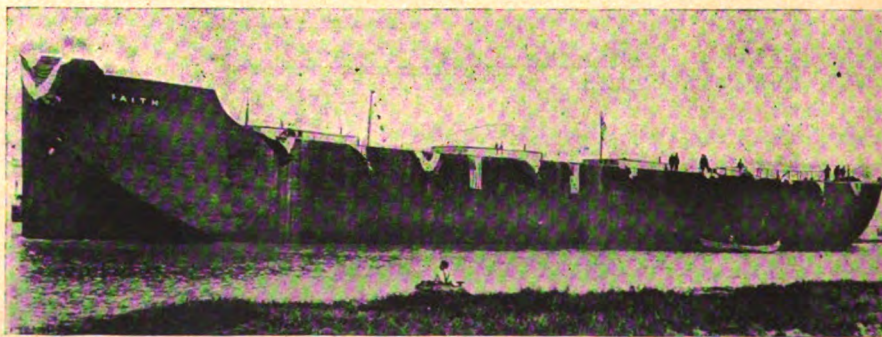
In 1899, Gabellini, of Rome, began to construct concrete scows and barges. In 1905 he built a 150-ton barge and

in the following year a similar barge was built for the Italian navy. Before acceptance this barge was put to a severe test by being driven against some piling and afterward being rammed by a steel towboat. The results of these tests were so satisfactory that the construction of similar barges followed.

Launches First U. S. Wood Ship on Atlantic

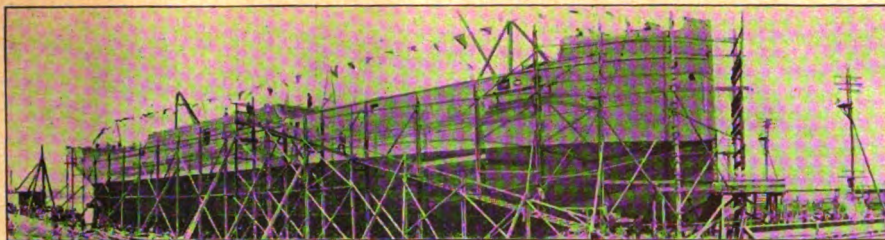
The first wooden ship to be launched along the Atlantic coast for the Emergency Fleet corporation left the ways, March 19, at the Kearny, N. J., yard of the Foundation Co., New York City. She was christened the COYOTE. In attendance at the launching were federal and state officials and several hundred other invited guests. The vessel, as she glided into the Passaic river, carried the following legend: "Our second contribution to the war. Other ships to follow: Forty 5-masted auxiliary schooners, thirty-six 150-foot steel mine sweepers, nine 3500-ton cargo carriers and four cargo hulls."

The COYOTE is of the single-deck type, designed by Theodore N. Ferris, for the United States shipping board. She will be driven by a 1400-horsepower triple-expansion engine, which will give a speed of 10 knots. She is 281 feet overall, with 46-foot beam, and of an approximate deadweight of 3500 tons. The superstructure will be completed in April, and the ship then will be turned over to the government for the installation of engines, boilers and auxiliary machinery. When the ship is completed about 1,330,000 feet of timber will have been used, also 715,000 pounds of metal fastenings and 58,000 pounds of steel stripping. The vessel will be rated Class A-1



THE FAITH—LARGEST CONCRETE VESSEL EVER BUILT

for 15 years by the American bureau of shipping. The successful launching of the COYOTE reflects great credit upon the Foundation Co. When contracts for the construction of this



THE COYOTE JUST BEFORE LAUNCHING

type of ship were awarded early last fell to this and 22 other shipbuilding companies, the Foundation Co. had not so much as started on its Kearny yard. Nevertheless, despite the fact that the company had to develop a site, much of which was originally under water, and equip a yard, it was the first to launch a hull. The next launching at this yard is expected to take place in the near future.

Almost simultaneously with the recent launching at Kearny, the COMMANDANT ROISIN, the first of a fleet of 40 auxiliary schooners for one of the allied governments was launched at one of the Foundation Co.'s shipyards on the Pacific coast. It is expected that the ship will be delivered to the owner on May 30 and the last of the vessels under the same contract by Nov. 30. These vessels are to be equipped with coal-fired water-tube boilers and twin

350-horsepower triple-expansion engines, which, aided by sails, will give a speed of 9 knots. Another shipyard of the Foundation Co. has launched two wooden cargo steamers for another of the allied governments.

Piez Asks Senate for New Shipyards

The speeding up of shipbuilding, if losses from submarine activity are to be offset, was urged a few days ago by Charles A. Piez, vice president of the Emergency Fleet corporation, at an executive session of the senate commerce committee. Mr. Piez deplored too much optimism over the submarine situation, saying that the menace was still grave.

As an outcome of the statements made by Mr. Piez on the progress

and another to be built upon the fee system, such as the Hog Island yard near Philadelphia.

The two yards, it is intended, are to have a capacity of 10 ways each. The government yard is to cost \$1,500,000 and the private yard approximately the same. Mr. Piez urged the construction of at least two yards as necessary to carry out the building program of the government.

With the first of the eagle boats, the new type of submarine chasers for the navy, scheduled for launching in June, Henry Ford, the builder, has assured Secretary Daniels that it would be possible under great stress to turn the craft out at the rate of three a day. Under present plans, Mr. Ford contemplates launching a boat a day after the building process is in full swing.

Approve Change in Size of Ship Timbers

APOINTMENT of John H. Kirby, Houston, Tex., of the Southern Pine association, as the government's lumber administrator for the south, and modification of the Ferris type of wooden ship to meet limitations of natural growth of the southern forest stand, followed a three-day exchange of view between representatives of the southern pine lumber industry and the United States shipping board.

Word has gone out to southern pine mills that the shipping board would no longer insist on frame timbers wider than 24 inches. This is a reduction in size from a maximum of 34 inches. Southern lumbermen have for months contended that the laminated or "built-up" timber is entirely practicable for the framing of a wooden vessel, and this view has been sustained by actual shipbuilding operations recently carried out with great success in private yards. This method of construction will at once be put into effect on the Atlantic and gulf coasts, both as to Ferris ships now building, and those to be built in future along the gulf. Original specifications will be adhered to in building Ferris ships on the Pacific coast, where

large size timbers are easily available.

Architects of the shipping board are now engaged in designing a modified form of Ferris ship, contracts for 150 of which will be awarded gulf coast shipbuilders as soon as ways for them are empty or new ways constructed. These ships will be built of southern pine.

Southern pine manufacturers who attended the Washington meetings pledged the industry to produce timbers sufficient to construct at least 300 modified Ferris ships a year, in addition to schedules on which the mills are now working.

A timber survey of the south has been undertaken by the new lumber administrator, to ascertain definitely the forest resources of the section as they may be applied to ship construction. Mr. Kirby has established headquarters in New Orleans, and has complete authority to take all necessary steps to get out timbers needed for the Emergency Fleet corporation.

Because of recent developments, and the changed situation now existing, southern lumbermen found it unnecessary to appear before the senate com-

merce committee as planned. A written statement briefly outlining the salient facts of the problem was presented. The association says: "As a result of readjusting timber requirements, thereby adapting the schedules to the southern woods, the shipping board has made it possible for us more adequately and practically to furnish the needed supplies. Due to this situation we will be in position not only to hasten the shipping board's needs more effectively, but to aid the country's great necessity. Southern pine forests are so extensive that they readily produce enormous quantities of ordinary size timbers. Shipbuilding promises to be speeded up tremendously."

Shipbuilding in Texas

The shipbuilding industry which has grown up at different ports upon the gulf coast of Texas as a result of the war demand for bottoms, will prove to be permanent, judging from the size, magnitude and solid type of construction of some of the different yards. In Texas the claim is made that the ports of that state afford ideal sites for shipbuilding plants,

as a wealth of raw material is near at hand. This is particularly true as to timber and iron ore. If iron and steel plants are established the essentials for constructing both wooden and steel ships will be easily available.

The construction of wooden vessels is now going on in shipyards at Orange, Beaumont, Houston and Aransas Pass, all in Texas. The industry is giving employment to several thousand men. In the shipyards at Beaumont alone about 1000 mechanics and laborers are employed. Hulls for 19 ships are being built in six shipyards at Beaumont at a cost of about \$5,950,000. The owners of these shipyards are the Beaumont Shipbuilding & Drydock Co., McBride & Law, Henry Piaggio, Lone Star Shipbuilding Co., Tarver Shipbuilding Corp., and J. N. McCammon.

Radnor Launched at Chester Yard

On March 23, the Sun Shipbuilding Co., Chester, Pa., launched the steamer RADNOR. This vessel was originally contracted for by the Cunard Steamship Co., but was later commandeered by the Emergency Fleet corporation. The dimensions of the vessel follow:

Length b. p., feet.....	435
Beam, molded, feet.....	57½
Depth, molded, feet.....	38
Designed speed, knots.....	10½
Indicated horsepower.....	2600
Draft, feet.....	26
Deadweight, tons.....	10,000
Gross tons.....	7470

This vessel has three complete decks, four large cargo holds, large cross bunker for coal and deep tank for ballast or oil fuel, with a double bottom except under machinery spaces. The propelling machinery is fitted amidships. Hinged kingposts mounting four 5-ton booms each are fitted fore and aft, with one 30-ton boom at the main hatchway. Two kingposts amidships are fitted with one 5-ton boom each. Telescopic topmast for the wireless antennae is fitted amidships. The deck machinery consists of steam steering gear, steam windlass, steam capstan, four compound-gear winches and six single-gear steam winches, fitted at the hatchways. Accommodations for the captain and officers are provided in deckhouses amidships. Engineers' quarters and messrooms are in side deckhouses. The crew is berthed in the forecabin. The vessel mounts a 4-inch gun forward and a 5-inch gun aft for protection against submarines.

The propelling machinery consists of triple-expansion reciprocating engines provided with steam from three single-ended Scotch boilers. The usual auxiliaries for this class of vessel are fitted in connection with the main engines.

Indian Names for Ships

The 120 vessels to be launched by the American International Shipbuilding Corp. from the Hog Island ways have been named by Mrs. Woodrow Wilson, wife of the President.

The names selected are of pure Indian origin. The list follows:

Red Jacket.	Skanawono.
Sac City.	Skaneateles.
Sacandaga.	Shippack.
Saccarappa.	Skitticook.
Saco.	Skokomish.
Sagaporack.	Skowhegan.
Sago.	Skunkscut.
Saguache.	Snapeene.
Sahale.	Socatean.
Saluda.	Solano.
Sangamon.	Somanauk.
Sapinero.	Souhegan.
Sarcoie.	Souneunk.
Satartia.	Squam.
Saucon.	Squamico.
Saugerties.	Succasunna.
Saugus.	Suisun.
Scantic.	Sunapee.
Scantacook.	Suspecaugh.
Schenectady.	Taghkanick.
Schodack.	Talladega.
Schoharie.	Tamaroa.
Schoodic.	Tampa.
Schroon.	Tankhanna.
Scitico.	Taopi.
Scooba.	Tarkio.
Sebamook.	Tatamy.
Sebeth.	Tatonka.
Sebewa.	Tawawa.
Sebewaing.	Taycheedah.
Seekonk.	Tehama.
Senatobia.	Tekonsha.
Shakopee.	Tenino.
Shamong.	Teton.
Shandaken.	Tintah.
Shannock.	Tippah.
Shaume.	Tishomingo.
Shavano.	Tiskilwa.
Shawan.	Tobesofka.
Shawangunk.	Tomah.
Shawano.	Tomasaki.
Sheboygan.	Tombicon.
Shepaug.	Tomoka.
Sheshequin.	Tonganoxie.
Shetucket.	Tonica.
Shickshinny.	Totowa.
Shinnecock.	Totoganic.
Shintaka.	Totoket.
Shivwitz.	Toulbah.
Shocoree.	Towaliga.
Shohokin.	Tucson.
Shohola.	Tulare.
Shope.	Tullahoma.
Sinnemahoning.	Ukiah.
Sinsinawa.	Unalaska.
Siskowit.	Unadilla.
Sisladobsis.	Wabeno.
Sisseton.	Waconia.
Sitkum.	Wahoo.
Skamania.	Wahpeton.

680 Shipyards in World

The report of an investigation by the shipping affairs bureau of the Japanese government, shows that there are 680 shipyards in the world, of which 264 are equipped to build steel ships of 1000 tons or more, while 416 can turn out vessels of less than 1000 tons. Great Britain leads the list and Holland is second. The plants are distributed as follows:

	Capacity 1000 tons up	Capacity less than 1000 tons	Total
Great Britain	92	144	236
British colonies	9	49	58
Holland	35	70	105
Germany	23	28	51
Japan	14	11	25
Italy	9	9	18
France	14	11	25
Austria-Hungary	5	4	9
Spain	3	11	14
Belgium	2	5	7
America	33	15	48
Norway	11	13	24
Sweden	5	12	17
Denmark	5	4	9
Russia	2	15	17
China	2	3	5
Other nations	12	12
Totals	264	416	680

California Shipyards Are Busy

Shipbuilding is growing in importance in California. Of 85 vessels under contract in California yards only 12 are wooden ships. Contracts still pending call for 21 more steel ships. In San Francisco and vicinity steel shipbuilding predominates but farther south in the Los Angeles district about one-third of the contracts call for wooden ships.

Recent registration in Los Angeles of men whose training has made them available for shipbuilding showed that there are more than 5000. It is thought that 20 tons per man is a fair estimate of the output of Pacific coast yards. With this as a basis, government agencies are endeavoring to develop a systematic and dependable method of estimation so that a poll of the trades of the operatives employed would determine the number of men needed to secure the desired output.

Although the government expects the Pacific coast section to turn out not less than 30 per cent of all ships required, that vicinity is far ahead of its schedule, according to western officials of the Emergency Fleet corporation. The volume of construction in California yards is shown in the following:

Vessels under contract	No.	Tonnage	Cost
Steel	73	700,000	\$105,000,000
Wood	12	50,000	6,000,000

With government orders on hand for 10 steel steamers of 9500 tons each, construction of the Pacific Coast Shipbuilding Co.'s plant, San Francisco, is being rapidly rushed to com-

pletion. An extensive spur-track system which connects the various portions of the 247-acre plant with the three railroads which traverse the company's property is nearly completed. A 400-foot machine and plate shop was recently completed.

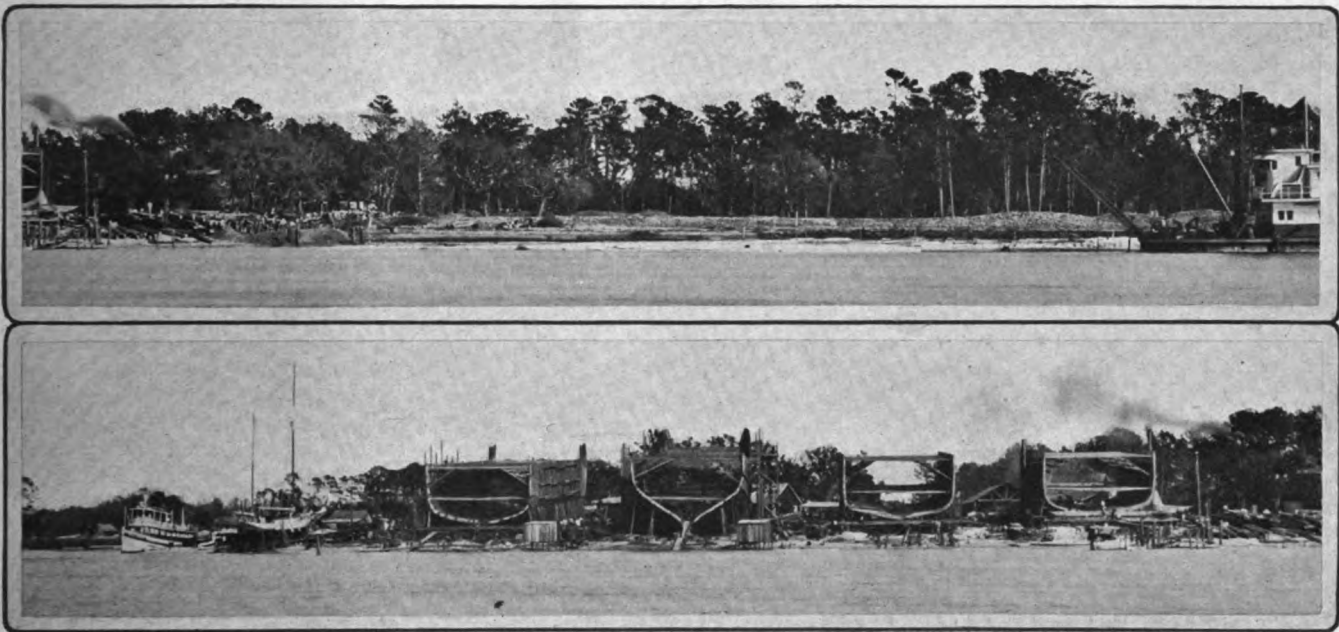
The Alameda plant of the Union Iron Works, San Francisco, with facilities for fabricating four vessels at once will be working on contracts with the government for months to come. An 11,700-ton freighter was launched at the yards recently. An average of 600 men were employed

daily on this vessel. A sister ship will be launched shortly.

The newly incorporated Southwestern Shipbuilding Co. has begun construction on the east side of the main Los Angeles harbor channel and at the southern end of Terminal island. This company has a contract for 10 ships of 8800 tons each. It is understood that the plan will be fully as large as that of the Los Angeles Shipbuilding & Drydock Co. and that an investment of \$1,000,000 will be made the first year. Marco H. Hellman is said to be largely interested in the southwestern company,

together with the Western Pipe & Steel Co., San Francisco, which is building 18 steel ships.

Another shipbuilding industry was added to the Los Angeles harbor district recently when the harbor commission granted permission to the National Engineering Co. to utilize a municipal pier for fitting wooden ships with engines and boilers for the government. Four vessels are to be fitted at once and others will be received as rapidly as they can be turned out by the northern shipyards. This industry will employ about 1700 men.



SPECIALLY ARRANGED FOR THE GERMAN INTELLIGENCE DEPARTMENT—TWO VIEWS OF THE SAME SHORELINE FROM PHOTOGRAPHS TAKEN LESS THAN SIX MONTHS APART

Shipbuilder on Gulf Makes Rapid Progress

ON DEC. 10, 1917, the International Ship Building Co., Pascagoula, Miss., acquired by purchase an additional 1800-foot frontage on the East Pascagoula river, increasing its holdings to an area 1200 x 3600 feet. It will be recalled that the International Ship Building Co. commenced operations in the Pascagoula district in the latter part of June, 1917. The present site was decided on because its location made possible an all-water route for moving materials and because the cost of maintaining a dredged channel was thought to be cheaper than that afforded by other proposed sites. The reason for this lies in the fact that the Pascagoula rivers carry large amounts of silt to the Gulf of Mexico. When the silt from the freshwater streams is deposited into the waters of the

gulf the salt in the latter causes the sand and clay to separate. The clay sinks and forms a layer on the bottom the consistency of yellow soap which may easily be cut while the sand is carried on to Horn Island and precipitated there in the huge deposits.

When purchased by the International Ship Building Co., the present site was entirely undeveloped and uncultivated, as shown in the upper view of the accompanying illustration. For this reason considerable preliminary work was necessary before the contract of constructing twelve 3600-ton wooden vessels could be undertaken.

On the new frontage 14 steel ships ranging from 4000 to 8500 tons are to be constructed. Although a period of only slightly more than two months has elapsed from the time since the

totally undeveloped land came into the hands of the company, the piling for two ways has been completed and the construction of the keels begun. The rapid progress made can be better appreciated by a comparison of the two views of the same stretch of land shown in the illustration accompanying this article. The original photographs were taken something less than six months apart.

The river near the proposed site for the docks has been dredged to a depth of 19.5 feet by the U. S. dredge WAHALAK. The same dredge was also used to complete a slip which is being used as a boom for shipbuilding timber.

The International Ship Building Co. was forced to face a rather severe housing problem for its employees when it commenced operations. This difficulty has been partly over-

come by constructing a 60-room hotel and 200 four and five-room cottages. The cottages are neat dwellings, equipped with modern conveniences, and the company is at present constructing a sewage system, electric light plant and waterworks.

Another active concern in Pascagoula is the Gulf Ship Building Co., incorporated by A. F. Dantzer and B. G. Boaz of Moss Point and H. H. Colle, Pascagoula. This company has purchased the Geo. Frentz shipyard on the East Pascagoula river where it will conduct a yard for general repair work. The Dantzer Shipbuilding & Dock Co., Hodge Shipbuilding Co., Dierks & Blodgett Ship Building Co., and the John De Angele shipyard are other concerns in the Pascagoula district engaged in building vessels for the Emergency Fleet corporation.

New Type of Wooden Ship

At the yard of the Allen Shipbuilding Co., Seattle, the keel has been laid for a wooden steamer of a special type of construction to be built for the Emergency Fleet corporation. The general arrangement of the vessel will be the same as that of the Ferris design and the same propelling machinery will be used although the vessel is slightly larger than the Ferris ship, with a length overall of 288 feet, a molded beam of 43 feet 8 inches, a molded depth of 26 feet 4 inches and a deadweight capacity of 3650 tons.

Plans for the new vessel are being drawn by Lee & Brinton, naval architects, Seattle. They are introducing a type of construction which they have heretofore used with success in

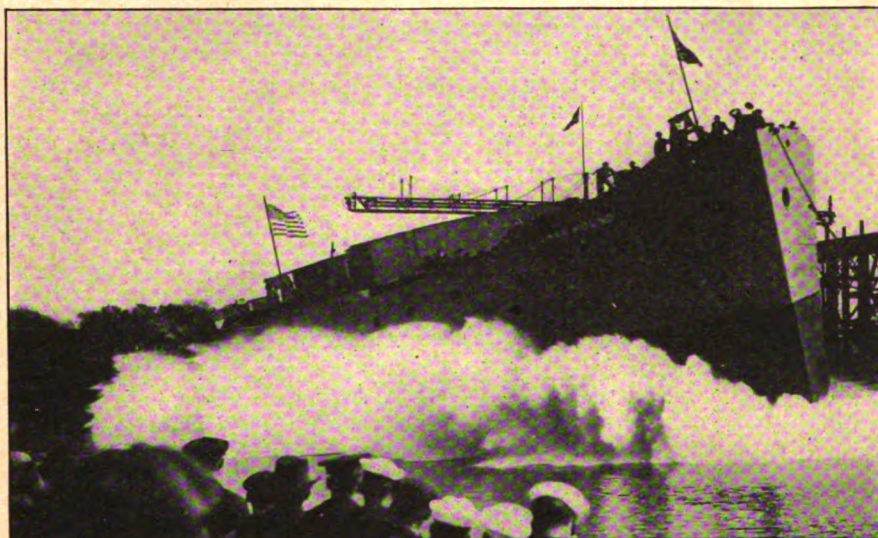
shape form of under body is produced. The advantages of this type of construction for rapid building are apparent and it is claimed by the architects that the construction is stronger than the ordinary type.

The plans for this type of construction have been approved by the American bureau of shipping, Lloyd's register and the naval architects of the shipping board. The contract calls for delivery of the hull in six months.

Seattle Will Launch 70 Ships This Year

Recently compiled data show that approximately 220,000 tons of steel will be used in building ocean-going steel steamships scheduled for launching in Seattle during the present year. Seattle's tentative launching program for the year calls for building approximately 70 steel steamships as follows: Sixteen 7500-ton vessels, fifty 8800-ton vessels, and four 9400-ton vessels. The deadweight cargo capacity of the ships will aggregate 597,000 tons.

Seattle's wooden shipbuilding industry will also be busy. More than 50 ocean-going wooden ships are scheduled for launching and these will add 150,000 deadweight tons to the Seattle record. Thus in steel and wood Seattle plans to launch 747,000 deadweight tons in 1918.



FAMILIAR SCENE ON THE GREAT LAKES—AN OCEAN FREIGHT CARRIER TAKING HER INITIAL PLUNGE

To Build 15,000-Ton Ships

Construction of 10 ships of 15,000 tons each, to be the largest cargo carriers in the American merchant marine, has been recommended by Chairman Hurley of the shipping board. Work on the designs was begun March 21. Secretary Redfield suggested recently that the board begin building larger ships, now that the construction of smaller ones is under way. Craft of the new design probably will be built in some of the older yards which are equipped for building large vessels for the navy. The vessels cannot be laid down for some time.

The steamship AVONDALE, recently launched from the yard of the Chester Shipbuilding Co., Chester, Pa., was taken to the plant of the New York Shipbuilding Corp., Camden, N. J., to have her machinery installed.

small craft and in which they are now adapting for use in vessels of the larger sizes.

Single instead of double frame construction is employed for the parallel midbody which is carried 45 per cent of the length of the vessel, each set of frames is made up of only three pieces. A deep floor timber runs in one piece from side to side of the vessel and connects to the two side timbers by a special method of bilge construction. The floor timber runs flat on top and the deadrise is sawed out of the lower side. The turn of the bilge has a radius of 4 feet 6 inches and the midship section approximates that of a steel steamer of the same size. Forward and aft of the parallel midbody, the floor timbers start to rise and are cut at the center line of the ship, while the side frames are slanted in toward the center line and with the radius of the bilge gradually increasing a fair ship-

At Belliveau cove, Digby, N. S., five large schooners are under construction within a radius of half a mile. P. A. Theriault & Co.'s 3-mast schooner CHARLES THERIAULT, is practically ready for launching and the keel has been laid for another vessel. Benjamin Belliveau & Co. have started work on a 3-mast schooner to be about 250 tons net. The firm's new 3-mast schooner, EMMA BELLIVEAU, went to the West Indies on her maiden voyage.

The R. H. Howes Construction Co., Boston and New York, has established a shipyard at Meteghan river, Nova Scotia. The company has leased the James Cosman shipyards at the mouth of the Meteghan river for a term of years. Mills, together with pattern shops equipped with modern machinery, have been equipped and are now operating. The company recently closed a deal for a tract of 500 acres of valuable timber land on the Meteghan river and it intends to enter the shipbuilding field on an extensive scale. Already one schooner is entirely framed and other keels are being laid.

Of the 81 commandeered and direct-contract ships delivered to the government and placed in operation up to March 9, Seattle has contributed 12.

Designs New Wooden Ship

The Peninsula Shipbuilding Co., Portland, Oreg., is now building a new type of wooden ship. Douglas fir is used. The CLACKAMAS, one of eight ships of this type which the company is building for the Emergency Fleet corporation, was recently launched. It is said that this vessel represents a distinctive type, the plans having been drawn at the instance of officials of the company after studying wooden ships generally, and profiting by experience in building auxiliary ships.

The lines of these vessels, it is said, have been worked out with a somewhat greater deadrise than that of the average cargo ship and the entrance and rim have been made easy. The object of these features is to make the vessel as steady as possible in a seaway, when running without cargo.

Although this type of ship exceeds the standard government ship in deadweight capacity by about 15 per cent, it also has an excess of approximately 225 horsepower which will enable it to carry the additional cargo, it is said, at a slightly increased speed. The ships will be powered with water-tube boilers and turbines with reduction gearing.

With the object of making the hull as strong as possible, a steel box keelson is provided which is wood-filled and protected from corrosion. It is pointed out that this arrangement does not decrease the cubic capacity of the vessel while it gives additional center-line stiffness.

The method of keeing the 'tween deck shelf, both above and below, in way of machinery space and hatches, also stiffens up these points, it is said, to a degree considerably in excess of the requirements of Lloyd's, Bureau Veritas or the American Bureau of Shipping.

These vessels are provided with fore-and-aft peak tanks for water ballast while running light. The object of this is to eliminate the strain vessels are subjected to in crossing the Atlantic, westbound, without cargo, ballast being almost impossible to secure in European ports at the present time.

The principal dimensions and particulars of these ships follow:

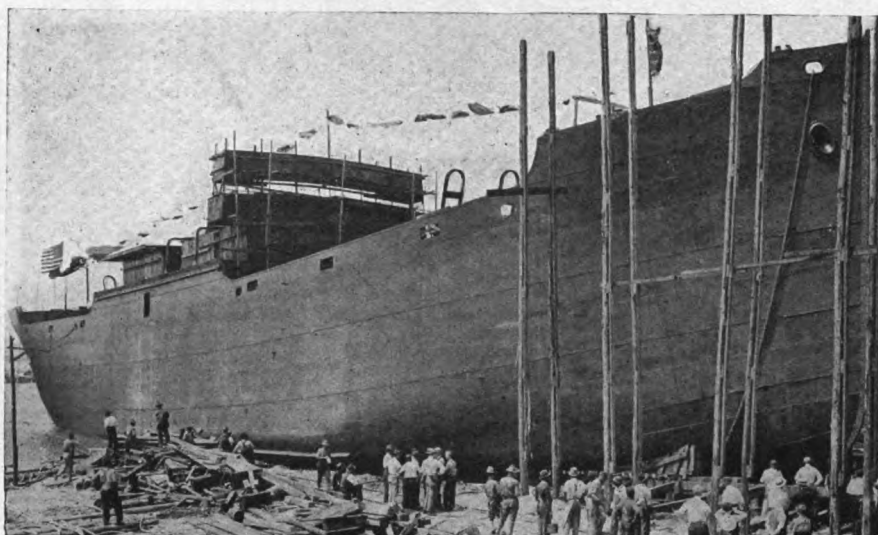
	Ft.	In.
Length over all.....	287	0
Length between perpendiculars.....	269	0
Extreme beam.....	49	8
Depth.....	27	6
Draft loaded.....	26	0
Deadweight capacity, tons.....	3665	
Shaft horsepower.....	1500	
Speed, loaded, in knots.....	10.5	
Steaming radius, nautical miles.....	4500	

Those who have never been inside the drafting room of a wooden shipbuilding plant do not realize the immense amount of preliminary drafting that has to be done before the hull can be laid out in the mold loft. With

the demand for wooden ships came, of course, the demand for draftsmen who could lay them out and to meet this demand K. H. Scheel, about a year ago, organized at Seattle a school to teach students this science. An intensive form of training is followed, but six students being allowed in one class. So far, the school has graduated 28 students who are now employed in various Pacific coast wooden-ship yards.

Government Shipyard in Australia

The British trade commission in Australia reports that the federal government has authorized the preparation of a slip at the state shipbuilding yard at Williamstown, Victoria, for constructing 3000-ton standard vessels. The federal



LITHOPOLIS FAST ON THE WAYS

authorities are to supply the necessary materials. The manager of the commonwealth naval dock yards at Cockatoo island, Sydney, after conducting an investigation of shipbuilding possibilities in Tasmania, announces that engines and their parts could be built at Launceston. He likewise believes that the iron foundries there with the addition of certain machinery, could readily make the class of work required. With regard to labor, he believes that skilled mechanics in sufficient numbers would be available.

Kyle & Purdy, Inc., City Island, N. Y., has recently taken over the old Hawkins shipyard which was later held by the Sound Shipbuilding Co. This now gives the corporation three large marine railways and a waterfrontage of over 8000 feet. The corporation has recently let a contract to Post & McCord, City Island, N. Y., for constructing a 3-story building, 60 x 180 feet. In addition to this, boiler houses, blacksmith shops, etc., will be erected. The corporation has several large contracts at present.

Tampa Yards Are Active

The shipbuilding industry of Tampa, Fla., is growing. The Tampa Dock Co., located at the head and easterly side of the estuary, is building four wooden vessels for the Emergency Fleet corporation and also has contracts for constructing four more similar vessels. The company also has contracts with the Emergency Fleet corporation to install engines and boilers, electric wiring and plumbing and shipfittings in these vessels. A contract is also said to be held for constructing a marine railway, dry dock and repair shops.

The Oscar Daniels Co., New York City and Chicago, is also constructing a yard for building steel vessels for the Emergency Fleet corporation, having a contract for ten 9500-ton ships. This company has five ways now

under construction. The construction of the yard is progressing satisfactorily. This yard will employ, at full capacity, from 1500 to 1800 mechanics and laborers.

A large cement corporation is investigating Tampa and its shipbuilding facilities with the idea of establishing a yard there for constructing concrete vessels.

Among the new companies which are expected to construct vessels at Tampa are the Williams Shipbuilding Corp. and the Stuart Shipbuilding Co.

Another corporation in operation is the Tampa Shipbuilding & Engineering Co. This company previously operated the yards now taken over by the Oscar Daniels Co. In 1917, a contract was made with New York interests for constructing two 3500-ton steel steamers. Later it is reported that the contract was transferred to the Cunard Steamship Co. The Cunard Steamship Co. named the two vessels

WAR WORK and WAR WONDER. After the entrance of the United States into the war the shipping board commandeered the two vessels and continued their construction through the Tampa Shipbuilding & Engineering Co. Recently the hull of the vessel nearest completion was named the **LITHOPOLIS**. On March 25 when the **LITHOPOLIS** was launched she stuck fast on the ways, as shown in the accompanying illustration.

New Pacific Coast Yard

The Pacific Coast Shipbuilding Co. has constructed a yard on Suisun bay, about 35 miles northeast of San Francisco. The yard embraces 247 acres, and is said to be one of the largest in area on the Pacific coast. The first construction work was done Jan. 6, and a building schedule has been followed calling for the first actual work on ships in March.

In this company, Henry T. Scott and John T. Scott return to the shipbuilding industry. Henry T. Scott was president of the Union Iron Works, San Francisco, for about 20 years and for four years he was president of the Moore & Scott Iron Works—now the Moore Iron Works—one of the largest shipyards on the Pacific coast. John T. Scott was connected with the Union Iron Works for 25 years, for the last 14 years as general superintendent. For 11 years he was vice president and general manager of the Moore & Scott Co. He is vice president of the Pacific Coast Shipbuilding Co. of which R. N. Burgess is president.

The first job of the new company will be the construction of ten 9500-ton deadweight steamers under government contract. While the \$1,500,000 plant will not be completed until May, the work was taken up with a view to having enough equipment in place by March to permit a start being made on the 10 vessels, which are to be delivered in 22 months. Ultimately between 3000 and 4000 ship workers will be employed. Seven launching ways are planned, four to be built at once.

The shipyard is situated on the easternmost branch of the chain of bays beginning with San Francisco bay. It is near the delta of California's two great rivers, the San Joaquin and the Sacramento, and the fresh river water obviates toredos and barnacles, thus assuring long life for submerged timbers. The shipyard site has a 2800-foot water frontage, with a 27-foot depth at high tide and ample room for launching large vessels. The property is served by the Southern Pacific, the Atchison, Topeka & Santa Fe and the Oakland, Antioch & Eastern railroads. In addition to the 247 acres of the plant site, the company

has at hand nearly 2000 acres of land for supplementary purposes.

The buildings include a machine shop 120 x 400 feet; powerhouse, 50 x 100; 2-story warehouse, 50 x 150; planing mill, 50 x 80; office building, 52 x 110; hospital; blacksmith shop 50 x 100, and a building of equal size for the tin shop, carpenter shop, electrical shop and acetylene plant.

Set Record on West Coast

The Pacific coast has established a new speed record in shipbuilding with the launching on March 27 of the 8800-ton commandeered steel steamship **WESTGROVE** in 61 days. The feat was accomplished by the Columbia River Shipbuilding Corp., Portland, Ore.

The keel of the **WESTGROVE** was laid Jan. 15 and she went into the water exactly 61 working days later. In this vessel, 2890 tons of steel were used,

Ship Deliveries and Launchings in March

The United States shipping board has issued the following summary of deliveries and launchings for the month of March, 1918:

Deliveries:	Deadweight tonnage
21 vessels	166,700
Launchings:	
6 contract steel vessels....	51,650
21 requisitioned vessels....	149,636
27 vessels	201,286
9 others (wood and composite)	31,500
Grand total	232,786

640,000 rivets were driven and two shifts, each of 480 men, worked eight hours daily. The accomplishment of this feat was the occasion of a great demonstration in Portland, which has contributed a large number of new vessels to the merchant marine within the last six months.

On March 28, the first steel ship, the **TACOMA**, built at Tacoma, Wash., went down the ways of the new plant of the Todd Dry Dock & Construction Corp. This company has three additional steel ships on the ways and all are expected to be in the water by June 1. These vessels are of the 7500 deadweight ton type. The work on the **TACOMA** started Sept. 25, active construction began Nov. 15. A year ago the site of this yard was under water and Tacoma celebrated the first launching with great enthusiasm.

March has produced an unusual number of launchings and they will increase rapidly each month during the year. The Skinner & Eddy Corp. sent into the water two hulls this month, **OSSINEKE** and **WESTERN QUEEN**, making

18 launchings since September, 1916. The Ames Shipbuilding Co. launched the **WESTMOUNT** in April.

The north Pacific launching record for March follows:

WESTGROVE, 8800-ton steel steamer, by Columbia River Shipbuilding Co., Portland, Ore., March 27.

BOILSTON, 3500-ton wooden steamer, by Grant Smith & Porter Shipbuilding Co., Portland, Ore., March 18.

MANADA, 3500-ton wooden steamer, by Grant Smith & Porter Shipbuilding Co., Portland, Ore., March 26.

WESTERN WAVE, 8800-ton steel steamer, by Northwest Steel Co., Portland, Ore., March 4.

LIBBY MAINE, 2500-ton wooden motorship by Standifer-Clarkson shipyards, Portland, Ore., March 26, for Libby, McNeill & Co.

WISHKAH, 4000-ton wooden steamer by Grays Harbor Shipbuilding Co., Aberdeen, Wash., March 10.

ARRAS, 2600-ton wooden motorship by Washington Bridge & Dredging Co., Seattle, for French government, March 12.

WAHIAKUM, 3000-ton wooden steamer by Seaborn yards, Tacoma, Wash., March 12.

PREMERTON, 7500-ton steel steamer by Seattle Construction & Dry Dock Co., Seattle.

OSSINEKE, 8800-ton steel steamer by Skinner & Eddy Corp., Seattle, March 14.

WESTERN QUEEN, 8800-ton steel steamer by Skinner & Eddy Corp., Seattle, March 28.

WESTBORO, 8800-ton steel steamer, by J. F. Duthie & Co., Seattle, March 26.

CULBURRA, 3000-ton wooden motorship, by Sloan shipyards, Olympia, Wash., March 13.

TACOMA, 7500-ton steel steamer, by Todd Dry Dock & Construction Co., Tacoma, Wash., March 28.

New Channel Needed

For generations the Horseshoe shoals has been one of the most formidable obstructions with which navigators on the Delaware river have had to contend. Marine insurance companies have had to pay out large sums of money for collisions, groundings and other accidents to vessels while navigating the river at this place.

During the winter months, as pointed out in the annual report of the department of wharves, docks, and ferries, Philadelphia, this locality tends to choke up with ice which blocks the commerce of the port of Philadelphia owing to the fact that the prevailing winds are from the west. This same condition would serve to keep open a new channel, if one were dredged along the Pennsylvania shore. The removal of the entire Horseshoe shoal and the deepening of the channel along the Pennsylvania side of the river would answer the double purpose of opening up for prompt development that section of Philadelphia below Greenwich piers and of minimizing the danger to navigation during times of fog, heavy winds or ice.

Attention has been drawn to the fact, within the last few years, that the anchorage grounds have been too contracted adequately to accommodate the needs of growing commerce. This condition also could be remedied by re-

moving the shoals and by dredging a channel. It is said that in the eastern cove, now a part of the 35-foot channel project before the city of Philadelphia, there could be set aside one of the best anchoring grounds in any

port along the Atlantic or Gulf seaboard.

The removal of these shoals has been the subject of discussion for many years and the importance of early action is now emphasized by the great increase of commerce to the port of

Philadelphia. It is pointed out that since the improvement and deepening by the United States government of the Delaware river channel, deep-draft ocean carriers are daily arriving and departing with full cargoes.

Rare Woods Used in Shipbuilding--II

By C. D. Mell



This is Mr. Mell's second article. The first, which dealt with mahogany, appeared in the April issue. This installment deals with teak, that wood of romance of which old-time battleships, or ships of the line, as they were styled, were constructed. Mr. Mell's next article will appear in an early issue.

Elephants a-pilin' teak

*In the sludgy-squidgy creek,
Where the silence 'ung that 'eavy
you
Was 'arf afraid to speak.*

—KIPLING.

FEW foreign woods are better known to naval architects and marine engineers than teak (*Tectona grandis*) which is the product of a majestic tree growing in southern India, Ceylon, Burma, Siam, Malay States, and Andaman and Nicobar islands. It is found also in the mountainous parts of Sumatra, Celebes, Sumbana and Java. The latter, however, is the only island of the archipelago producing a quality of teak generally considered available for shipbuilding. That from Burma is now most highly esteemed and wood of selected quality from this region is registered by Lloyd's as the only kind in the first or 16-year class.

The English government has repeatedly taken stock of the amount of standing teak and from the reports it appears that there are still vast areas in parts of Burma and Siam that have never been exploited. The wood has been drawn from these tropical forests bordering the water courses for over a century but further inland the forests have been left untouched. With the present means of transportation, it would cost more to transport the logs to the port of shipment than the wood is worth.

Teak wood is of a light-brown color and when freshly sawed it has a faint odor, somewhat like that of rosewood. It is hard, moderately



light, 40 to 50 pounds per cubic foot, easily worked and strong. It seasons readily, shrinks only slightly and, being of an oily nature, does not corrode iron. Teak is extremely durable and is classified in Lloyd's Register as the only 16-year wood recommended for timbering and outside planking. Its mechanical properties are quite remarkable. An English writer on Indian woods states that the cohesive force of teak wood varies from 13,000 to 15,000 pounds per square inch, the weight of its modulus of elasticity is 2167 pounds per square inch and the weight per cubic foot varies from 41 to 53 pounds. Representing the strength of oak as 100, that of teak will be 109. Representing

the stiffness of oak as 100, that of teak will be 126 and its toughness 94.

The uses of teak are numerous. Like mahogany, it was first used in shipbuilding but it is now admitted in the class of structural timbers employed for a variety of purposes. In India, it finds its greatest use for house building in the form of beams, rafters, battens, posts and boards. As a shipbuilding wood it is used for planking, armor plate backing in battleships, boatbuilding, and for masts and other spars, and oars. It is also used for making railroad cars, wagons, and for parts of light vehicles.

Its early use in this country was exclusively for shipbuilding and for

many years large quantities were brought here from England. It has proved to be a valuable wood for armor backing and decking, and for companion ways, seats, rails and joiner's work in boats of all kinds.

About 30 years ago a number of teak logs were shipped to the Washington navy yard, where they were floated in the Potomac river. They soon became water soaked and sank to the bottom. In deepening the channel some years later, these logs were recovered and found to be in perfect condition. While all woods are more durable under water than in contact with soil and air, teak is durable under all conditions. It favors mahogany in some respects and is now used for many of the purposes for

which the true mahogany was formerly employed. A century ago mahogany was used for the planking and interior finish of ships, but teak has now displaced it entirely in naval construction. Teak is used at the present time in the construction of many private yachts, not so much on account of its beauty, as it is for its great strength, durability and natural resistance to fire.

As early as the year 1848 India exported over 18,000 tons of this wood. The present cut for all of India amounts to about 300,000 tons. Of this amount it is estimated that 1,000,000 board feet are consumed in the United States.

The wood is sold by the ton and the price varies considerably, depend-

ing upon the demand and upon the grade. The best logs of over 1 ton, before the war, brought about \$56 per ton of 50 cubic feet. This is the price that was quoted at the shipping depots. In this country the average price of teak was about \$230 per 1000 board feet, which is the price f.o.b. factory. The stocks now on hand in this country are quoted at from \$400 to \$500 per thousand feet. Just prior to the war, New Jersey ranked first in the use of teak lumber with a consumption of a little more than 300,000 feet. New York consumed about 200,000 feet, and Pennsylvania and Virginia each about 50,000 feet. The four states named together used about two-thirds of the entire amount imported.

Latest News from American Shipyards

THE Weehawken Dry Docks Co., Weehawken, N. J., has bought a tract of land near Peekskill, N. Y., on the east bank of the Hudson river. The company will invest approximately \$4,000,000 in a shipyard. Arrangements are said to have been practically concluded with the Emergency Fleet corporation for building 14 steel ships of 7500 tons, 12 concrete vessels of 3500 tons and 100 barges.

The New York Shipbuilding Corp., Camden, N. J., intends to build approximately 1000 two-story houses for its employees. The houses are to cost about \$2,500,000.

The Chester Shipbuilding Co., Chester, Pa., recently issued a list of 71 miscellaneous machines and tools for its shipyard.

The Vulcan Iron Works, Jersey City, N. J., has received a contract from the Emergency Fleet corporation for marine engines. The iron works will purchase a large number of machine tools and make an addition to its plant.

The Ferro-Concrete Shipbuilding Corp., New York, and the Fougner American Steel Concrete Shipbuilding Co., New York, will establish shipyards in the east for constructing concrete vessels for the Emergency Fleet corporation.

The Merchants Shipbuilding Corp., Bristol, Pa., has purchased extensive property near its plant which brings its total waterfrontage up to 2 miles.

The Supple & Ballin Shipbuilding Corp., Portland, Oreg., has recently increased its working schedule to 10 hours with the object of speeding up production.

The Potomac Shipbuilding Co., Quantico, Va., recently organized, is planning to construct a shipbuilding plant at a

cost of approximately \$200,000. The company will build cargo and other type vessels. George R. Collins, Washington, is president of the company.

The Twohy Brothers Co., Portland, Oreg., has been awarded contracts for 10 steel vessels of about 8000 tons each. The ships will be built by the Erickson Engineering Works, Seattle.

The Patterson-McDonald Shipbuilding Co., Seattle, intends to build a new machine shop which will cost \$12,000.

The Skinner & Eddy Corp., Seattle, will erect a pipe shop at a cost of \$5000. The building is to be 40 x 172 feet.

The Meacham & Babcock Co., Seattle, intends soon to erect a blacksmith shop, 45 x 80 feet, at a cost of \$3000.

The Seattle Construction & Dry Dock Co., Seattle, is planning to build another 12,000-ton floating drydock for its plant on Elliott bay. The plant now has one 3000-ton drydock and one 12,000-ton drydock.

The wooden steamship MANADA, the first government vessel to be completed at the Aberdeen Shipbuilding Co.'s yard, Aberdeen, Wash., was launched recently. The vessel is of the Ferris type. The company has already laid another keel.

Seattle is to become a concrete shipbuilding port. The Inter-Ocean Barge & Transport Co., organized some months ago, and incorporated for \$1,500,000, has begun to make preparations on Ballard beach for constructing a reinforced concrete deck scow of 550-ton deadweight capacity.

The Skinner & Eddy Corp., Seattle, recently launched the steel steamer OSSINEKE 64 working days from the

time the keel was laid. This vessel is the seventeenth steel ship launched by the company since Sept. 16, and the fourth ship to be launched the present year.

Announcement comes from Portland that the government has given permission for the building of six wooden steamships for Japanese interests and six for French owners. These hulls are to be built by the Kiernan & Kern Shipbuilding Co., which has the Japanese contracts and the Willamette Shipbuilding Co., which holds the French contracts.

The Liberty Shipbuilding Co. recently announced that it would begin construction of ten 300-ton concrete ships for the government. The vessels will be constructed at the company's Brunswick, Ga., yard. The contract calls for the delivery of the first vessel in June and the rest at the rate of one ship a week thereafter. The estimated cost of each completed ship is placed at \$375,000.

The steamer LITHOPOLIS was launched recently at the yard of the Tampa Shipbuilding & Engineering Co., Tampa, Fla. The new vessel is the first of two 3500-ton cargo carriers building at the yard for the shipping board.

A triple launching took place on the Pacific coast recently when three 9400-ton steel merchantmen took the water at Oakland, Cal. The vessels were the ANIWA, SHINTAKA and OAKLAND. These vessels have turbine engines and will log 11 knots an hour. The SHINTAKA and ANIWA were built under contract with the Emergency Fleet corporation and the OAKLAND was commandeered from the Cunard Steamship Co. The keels of the SHINTAKA and the ANIWA were laid Nov. 16 and that of the OAKLAND Nov. 12. When the vessels were put into the water the work was 30 days ahead of schedule.

On the Coasts, Lakes and Rivers

What's Doing and Who's Doing It

Lake Season Will Open With Confidence

By M. H. Kinkaid

GR^EAT LAKES ports, the waterfronts of which have been dormant all winter, are now the scenes of activity as hundreds of vessels are being refitted and repaired preparatory to the season's opening. The lakes are reported fairly free of ice and the prospects for an early opening of navigation are excellent. The ore-carrying fleet will be smaller than that of 1917 owing to the fact that three vessels were lost last year and 13 have been taken over by the government for salt water service. M. A. Hanna & Co. estimate that the trip capacity of the 16 vessels was 59,500 tons and figuring 20 trips for each ship, they could move 1,190,000 tons of ore during the season.

There will be 379 bulk freighters or ore carriers ready at the opening of the season and their capacity per trip will be 3,036,900 tons. Figuring 20 trips for each boat, the fleet can move 60,738,000 tons of ore during the season but many of the big carriers will go up light and therefore will, of course, make more than 20 trips. For this reason, and in view of the highly developed degree of efficiency for which the lake carriers are famous, no uneasiness regarding the fleet's ability successfully to handle the commerce of the lakes during the season is felt.

All is in readiness for opening the coal and ore shipping season at Huron, Mich. The loading machinery was tested out recently and found to be in first class working order.

The Canadian lightship FALKEN, which sank at Scudder's dock, Pelee island, during the winter, has been raised and taken to a Detroit shipyard for repairs, before going to her station on Southeast shoal, Lake Erie.

Plans have been made for a good start in all lines of the lake trade. The freight movement will be directed largely by committees, and with every indication for an early start the vessel men and shippers are satisfied that there will be plenty of tonnage to take care of the business.

At a recent meeting of the representatives of the vessels and railroads, and of coal and ore shippers, Herman M. Griggs was appointed manager of the new coal and ore exchange which will direct the movement of coal and ore during 1918. Mr. Griggs has already taken charge and has lined up an organization to take care of the business.

The new exchange will have no connection with the Lake Erie bituminous coal exchange of 1917 which has gone out of business.

Capt. William J. McKay, a master of lake vessels for a period of 30 years, died recently in St. Mary's hospital,

Lake Mariners Beware!

OVER a century has come and gone since the roar of guns awakened the echoes of the Great Lakes but the naval activities of 1812 are to be recalled in 1918. No, the under-water boats of the Hun are not expected to infest the Great Lakes on a commerce raiding expedition but mariners of the great inland seas, while navigating Lake Ontario, must use caution just the same. Otherwise their vessels may become the target of shells as powerful as any submarine can fire. The Canadian government is about to use Lake Ontario as a gun range for the Royal Flying Corps. The machine gun ranges will be located at Beamsville, about 8 miles west of Point Dalhousie lighthouse. The Canadian government will mark off the danger zone by means of flags and buoys and great emphasis is laid on the fact that vessels passing inside these buoys during the hours of practice incur a serious risk.

Detroit. He was 55 years old and until recently resided in Chicago.

Thirty thousand passes will have to be issued to Cleveland men who assist in various ways in carrying on lake traffic according to United States Marshall Lapp. Under regulations made by the government some time ago, the lake front is a restricted zone and none but bearers of passes is permitted to enter it. Precautions are being taken to prevent the passes getting into the hands of alien enemies. The permits are issued only on application of shippers and minute details are entered on each pass about the person receiving it.

Wreckage consisting of heavy timbers and a life raft marked HENRY CORT were washed ashore near Port Clinton re-

cently. The sinking of the HENRY CORT was illustrated in THE MARINE REVIEW for April. She went down while attempting to release the ice-bound fleet last December in western Lake Erie.

The passenger season on the Great Lakes was opened March 26 by the steamer WESTERN STATES of the Detroit & Cleveland line. The vessel left Detroit at 9:45 in the morning and docked in Cleveland at 5 in the afternoon.

Vessel masters on the Great Lakes are being notified by the United States shipping board of an amendment to the rules of the United States steamboat inspection service which now permits all lake captains, with two or more years' experience as such, to become masters of coastwise vessels in the new merchant marine.

Rates for hull and cargo insurance on the Great Lakes for 1918 will be the same as they were last season and the bulk of the business will be placed with American companies, according to E. P. Lenihan of Wilcox, Peck & Hughes. The hull rate for steel vessels will be 3½ per cent, net, and the cargo rate on coal and ore will be 7½ cents per \$100.

The Manistee, Mich., fleet this season will be the smallest in years. The J. Q. Nessen steamer, SIDNEY O. NEFF, has been sold to parties in Marinette, Wis., and the MAGGIE MARSHALL in Detroit. Members of the naval examining board were in the city recently inspecting the Northern Michigan line steamer MANITOU and the Chicago & South Haven steamer CITY OF SOUTH HAVEN to ascertain their adaptability for salt water service. Small craft for the mosquito fleet were also inspected.

To the lake freighters taken over by the United States shipping board for ocean service since the close of navigation last season has been added the steamer FRONTENAC owned by the Mentor Transit Co. The steamer is a Cleveland product, built in 1889. Her carrying capacity is about 3200 tons.

City officials of Toledo, O., are planning to obtain rental of the Bay View park lagoons from steamship companies that winter boats there. City Engineer McClure has notified Mayor Schreiber that the Pittsburgh Steamship Co., which has a fleet in the Bay View lagoon, is willing to dredge the lagoons 16 feet deep at a cost of \$10,000 if given the exclusive right to winter there.

McClure said the city could probably realize \$2000 rental annually from this source.

* * *

Capt. J. T. Reid of the Reid Wrecking Co., Port Huron, Mich., recently returned from Galveston, Tex., where he inspected the wreck of the oil barge DELAWARE which was lying on her beam ends in Sabine pass. The DELAWARE sank in December and it is understood that the Reids will get the contract to salvage the boat.

* * *

Bids for improvement of Vidal Shoals channel, St. Marys river, were opened recently in the office of Col. F. W. Altstaetter, Detroit, district engineer. Specifications call for supplying equip-

ment. The Great Lakes Dredge & Dock Co., contractor on other Vidal Shoal work, and the only bidder, offered to supply a plant including dredge tug and scow at \$45 an hour with derrick, driver and crew at about \$12.75 an hour.

* * *

Definite announcement was made recently of a deal in which the Reid Wrecking Co. with its drydock and shipbuilding plant at Port Huron is merged with the Foundation Co., one of the largest construction concerns in the United States. The deal is said to involve a large amount of money and members of the Reid company will hold stock in the larger concern. It is proposed to lengthen the present drydock to 625 feet to accommodate the largest steel steamers on the lakes

and the dock will be rebuilt of concrete. In addition, keels will be laid for 10 steel steamers of an average length of 150 feet, described as trawlers. They will be ready for delivery at the close of navigation this year.

* * *

The names of the steamers WESTERN STAR and A. E. STEWART, which formerly were American vessels but now hail from Canada, have been changed. The WESTERN STAR has been renamed GLENISIA and the STEWART, GLENARCHY.

* * *

The steamer FAYETTE BROWN is in drydock having 10 plates on her hull repaired. The plates were damaged as a result of grounding and ice contact last spring.

Up and Down the Pacific Coast

UNUSUAL atmospheric conditions, reducing the range of visibility, are cited as the cause for the mishap to the Pacific Steamship Co.'s Oriental liner UMATILLA, which grounded off the Japanese coast about 100 miles from Yokohama, March 4. The vessel carried a full cargo of box shooks and general merchandise for Hongkong and Singapore and was making her second voyage to the Straits Settlements in the company's new Oriental service.

* * *

Advices from Honolulu indicate that enemy agents were responsible for crippling the new commandeered steamship SACRAMENTO on her first voyage out of Seattle, where she was built. The vessel was disabled at sea and was towed into port, where an investigation disclosed several steel bolts in one of her cylinders.

* * *

While offshore lumber shippers are worrying about obtaining vessels to carry their product to the foreign markets, owners of coastwise lumber vessels are reaping large profits. The going rate to San Francisco is \$7 per thousand and \$8 per thousand to southern California, as compared to normal freights of \$3.25 and \$4, respectively. Every carrier that can be pressed into the California trade is being operated and owners are said to be making good returns. Even in the local trades, tonnage is extremely scarce, but there is not the probability of its being commandeered as is the case with offshore vessels.

* * *

The American motorship WERGELAND, built for Norwegian interests at Olympia, Wash., and laden with a cargo of Puget Sound lumber for Sydney, Australia, met with a serious mishap on her maiden voyage. She returned to port leaking, with part of the deckload gone and with two masts broken off at the top of the deckload. The WERGELAND is equipped with oil engines and it is claimed that she would likely have drifted ashore had she not been equipped with power. The ship is now repairing at Port Blakely, Wash.

* * *

Extensive improvements are planned by the Seattle Construction & Dry Dock

Co. More than six acres of adjoining property have been taken on a long time lease with the object of extending the yard, which is rapidly growing. It is understood that another 12,000-ton drydock is to be built, although announcement of this improvement has not yet been made. The plant now has one 12,000-ton dock and one of 3000-ton capacity. Shipping conditions have expanded so rapidly on Puget sound that it is considered likely the third dock will be built shortly.

* * *

The steel steamship ELIHU THOMSON, built at Newcastle, Eng., in 1888, has been purchased by the Akutan Whaling Co., for service between Seattle and the whaling station at Akutan, Alaska peninsula. The ELIHU THOMSON has been on this coast for many years. For a time she was operated in the Hawaiian trade. In recent years she has plied between Puget sound and Nome, Alaska, carrying refrigerated meats.

* * *

Norton, Lilly & Co., steamship agents, have opened a Seattle office and are planning an active part in the Oriental trade. This company has just discharged the Danish motorship AUSTRALIEN with 10,000 tons of cargo from India and Straits Settlements and other large vessels are soon to follow.

* * *

To attend launchings at his Seattle and Tacoma plants, William H. Todd, New York, recently made a visit to Puget sound. He witnessed the debut of the first steel steamship from the Tacoma yards, the TACOMA, and also the BREMERTON from the Seattle yards. William S. Doran, a New York capitalist, and James Esplen, who is supervising shipbuilding in Canada for the British government, are also in the Todd party. President Todd announced at Tacoma this week that he had signed a contract to build 10 additional vessels of 7500 deadweight tons, similar to the TACOMA, at the Tacoma yards.

* * *

Falling into financial difficulties, the Sandstrom Shipbuilding Co., Seattle, has been placed under a receivership. This firm is building four wooden ships for Norwegian interests and two for

Italian owners. The liabilities are said to approximate \$1,000,000, the Norwegians being the principal creditors. One of the ships is about 40 per cent complete.

* * *

Extreme shortage of cars is hampering trade through Puget sound. The result has been an embargo placed on Oriental shipments which will stop west-bound freight but will not relieve the situation for the lumbermen who are clamoring for cars to take their product to the East. Loaded cars awaiting discharge at terminals are on the road for several hundred miles into the interior. Never before has the congestion been so acute.

* * *

Observers of the trend of Oriental trade anticipate a sharp falling off in business with Japan and China during the latter part of the year. The agreement between the United States and Japan, whereby the latter is to furnish 150,000 tons of steamships is expected to increase the shortage of tonnage in the Pacific, while partial embargoes on exports of products from Japan are expected to reduce the movement of freight materially. On the other hand, Japan is to get heavy shipments of steel which will likely move through Seattle and will help to maintain Puget sound's high level of trade with the Far East.

* * *

Late advices announce the loss in the war zone of the American steamship CHATTAHOOCHEE, by a submarine. This vessel was in command of Capt. R. C. Lawe, Seattle, a well known Pacific mariner. The CHATTAHOOCHEE was formerly the German steamship SACHSEN. She arrived here from the Orient in December and from here was dispatched to European waters under orders from the shipping board.

* * *

Uncertainty of conditions, increasing government restrictions and continued scarcity of tonnage are making it extremely difficult for charterers to operate in the Oriental trade. Vessels can be fixed with no degree of certainty as they are subject to commandeering as the government's requirements increase. The Norwegian steamship STORVIKEN has lain idle a month on

Puget sound awaiting a decision as to her status. She has just been chartered by the United States shipping board and her previous engagements cancelled.

* * *

The government having fixed the price of wheat for the coming season, placing Pacific coast terminals on a parity with Chicago and New York. The shipping of wheat and flour by water, it is believed, will be resumed on a large scale from Puget sound and Portland during the coming fall and winter. In normal times, the grain export business employed a large fleet of vessels, but during the last two seasons, the scarcity of tonnage and unsettled conditions diverted this trade largely overland.

* * *

The Skinner & Eddy plant, Seattle, delivered the 8800-ton steamship WESTLAKE to the shipping board 23 working days after she was launched and 95 days from the time the keel was laid. According to foreign and American experts who were in Seattle at the time, the company's achievement is a world record for quick time in shipbuilding.

* * *

North Pacific yards have turned out about 30 auxiliary-powered schooners within the last 18 months.

* * *

Ten thousand seafaring men, members of crews of American steamships operated out of Pacific coast ports, were recently granted increases in wages rang-

ing from 25 to 35.5 per cent, according to announcements made by the companies involved. The increases in wages are for all classes of sea service.

* * *

The Pacific Steamship Co.'s liner, ADMIRAL EVANS, was beached on the sandy shore of Hawk inlet, southeastern Alaska, recently. The vessel was not stranded on the reef but the rocks ripped her side for considerable distance just forward of amidships. The oil tanks were penetrated and they soon filled with water.

* * *

The Seattle fishing schooner, PURITAN, one of the finest vessels of her type and rig on the Pacific coast, is reported a total loss near Cape Cleare, Montague island, Alaska. The PURITAN is valued at \$50,000.

* * *

Seattle now has specially uniformed waterfront police who although paid by dock operators, and other business men in the district, serve under orders of the chief of police.

* * *

The 5-mast auxiliary power schooner, GENERAL PERSHING, which was launched by the Olympia Shipbuilding Co. several weeks ago, has been taken over by the government.

* * *

The states of Oregon and Washington are in a position to furnish between 400 and 500 wooden ships a year, according to a statement made by witnesses

from the Pacific coast to the senate commerce committee. The witnesses also said that it would be necessary for the Emergency Fleet corporation to furnish the lumbermen with a standardized program. Fears of the shipping board that the lumber supply of the northwest is inadequate were declared unfounded.

* * *

Capt. John F. Blain of the United States shipping board recently appointed Capt. Arthur M. Sewall, member of a famous state of Maine family of ship-owners and mariners, as master of the new commandeered 8800-ton steel steamer WESTWOOD. This vessel was recently launched by the Ames Shipbuilding & Drydock Co., Seattle.

* * *

The 8800-ton Seattle-built steamer STOLT NEILSEN has been sunk in European waters, according to a cable recently received from B. Stolt Neilsen, Norway, owner of the boat. The vessel was commandeered by the British government last November. She was launched at Seattle, May 22, 1917.

* * *

The CULBURRA, the second big motorship to be constructed by the Sloan shipyards, Olympia, Wash., slipped into the water recently after several days of sticking on the ways. Hydraulic jacks finally pushed the vessel down the ways until she gained enough momentum to carry her to the water. Superintendent Peterson said that the trouble was caused by not enough incline having been given to the ways.

Along the Atlantic Coast

THE Warren line has taken over the Glasgow-Boston service of the Allan line, recently discontinued, and will inaugurate a new service. The office of the Allan line, State street, Boston, has been leased by the France & Canada Steamship Co., with R. B. Teakle as general manager.

* * *

R. L. Bean, Camden, Me., has launched the 4-mast schooner LAURA A. BEAN for Capt. C. A. Bean, Marblehead, Mass., the new vessel's hailing port. The schooner is of 629 net tons and 530 gross tons and she cost \$85,000.

* * *

The steam trawler SWELL, Capt. Thomas McComisky, recently found a 5000-pound anchor and chain while dredging on Georges banks. The big mudhook is believed to belong to a 5-masted schooner that foundered several years ago.

* * *

The 2-mast British schooner SCOTIA QUEEN has been sold to Mexicans who will use the vessel to transport cattle between Mexican ports. The vessel has been rebuilt at Boston.

* * *

Crews of fishing vessels are now subjected to rules that apply to sailors on merchant vessels and must carry identification cards and submit to examination by immigration officials.

* * *

The lake-built steamer RACINE, undergoing repairs at Boston, has been

purchased by the French government and will be rechristened RENE. The RACINE put in to Boston while bound from the St. Lawrence for New York with machinery crippled. She has been repaired.

* * *

The Metropolitan park commission announces that the Charles river in Boston will be closed for the week of July 8 when the lock in the dam will undergo necessary repairs.

* * *

The steamship SUDBURY, built in Chester, Pa., for the Shawmut Steamship Co., Boston, has been taken over by the government and will be commanded by Capt. C. F. Smith.

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The 70-year-old schooner GEORGE E. PRESCOTT, for some time used as a houseboat, will be rigged at Boston and placed in coastwise trade under name of ELK.

* * *

E. P. Carver, Boston, has sold the wooden sailing ship ARYAN to L. A. Pederson, San Francisco, for about \$100,000. The ARYAN was built at Phippsburg, Me., in 1893, and for some years has been employed on the Pacific.

* * *

A passage of 53 days from South Africa to Boston is recorded of a full-rigged Russian ship which logged 260 miles for 10 consecutive days and outdistanced several tramp steamers. The ship's captain says he would have cov-

ered the distance in 45 days had not adverse conditions been encountered while nearing the coast.

* * *

The historic city of Portsmouth, N. H., is one of the many places that has been revived by the shipbuilding boom. This is especially the case since the Atlantic Corp. received a contract for 10 vessels. This concern was recently organized in Boston and is financed by both Boston and New York capital. In 1917 the population of Portsmouth increased 20 per cent.

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The 1700-ton ferry steamer CASTLETON, the coal barge EDITH and a government lightship were destroyed by fire recently at Norfolk, Va. Two firemen aboard the CASTLETON were burned to death and Capt. L. A. Oleson of the EDITH severely injured. An explosion of a lamp aboard the CASTLETON caused the fire. The vessels were moored to a dock and no passengers were aboard. The CASTLETON had a passenger capacity of 5000.

* * *

With the arrest recently of Herman Lammers, a Hollander, customs authorities declared they had uncovered one of the cleverest smuggling devices they had ever seen. As a result of their investigations they seized 2000 tubes of a drug whose public sale is forbidden. The drug was concealed in tubes inserted in 2000 holes bored in the edges of the smuggler's trunk.

Red Hot Tips From the Trade

Pertinent Suggestions and Personal Gossip

P IPE tools are described in a booklet issued by the Greenfield Tap & Die Corp., Greenfield, Mass. The booklet contains 72 pages and is well illustrated. Aside from describing the company's line of pipe tools the booklet contains a short historical sketch of the company and many tables of useful information among which are the following: Standard dimensions of wrought iron gas and water pipe; standard dimensions of extra strong pipe; standard dimensions of double extra strong pipe; drill sizes for pipe taps; dimensions of Briggs standard taper pipe thread; dimensions of British standard Whitworth pipe thread; wire gage standards; copper wire table; United States standard gage for uncoated iron sheets and plates; weights of sheet copper; conduit sizes to be used with different sizes of wires and cables; decimal equivalents of fractional parts of 1 inch; squares, cubes, square and cube roots of numbers from 1 to 100; reciprocals of numbers from 1 to 200 and circumferences and areas of circles from 1/16-inch to 100 inches.

Steel for Ships

The Carnegie Steel Co., Pittsburgh, has issued a 16-page booklet on structural steel for ships. Stress is laid on the fact that shipbuilding practice should conform to uses established as standard in the fabrication of shapes and plates for bridges, buildings and cars and that useless and minute variations should be avoided. The booklet gives tables on channels and angles, weights of flat rolled steel, permissible variations of plates ordered to weight, and an outline of the standard practice in manufacturing structural steel for ships as recommended by American steelmakers and adopted by the Emergency Fleet corporation.

Feed Water Heaters

A neat bulletin describing and illustrating feed water heaters, steam engines, and other products is being distributed by the Griscom-Russell Co., New York. The feed water heaters are furnished in all sizes, either vertical or horizontal, in two types, for use with exhaust and with live steam. Seamless brass tubes,

expanded at each end into steel tube plates, one of which is fixed and the other of the floating type, allow for expansion. The shell is of close-grained cast iron. The water passes through the tubes and the steam through the shell. The steam engines built by the Griscom-Russell Co. are single and 4-valve, made in simple and compound styles, and are adapted to all classes of power generating service.

Marine Boilers

"Just About Marine Boilers" is the title of an attractive 15-page booklet recently issued by the Badenhause Co., Philadelphia. The boiler described is built on a continuous circulation system which is designed to give better steaming ability. The subject of water circulation in boilers is interestingly explained in the booklet with the aid of illustrations. The booklet is well written and will interest marine engineers and others interested in marine boilers.

New Method of Painting

"Aeron System" is the title of an attractive 40-page catalog recently issued by The De Vilbiss Mfg. Co., Toledo, O. The system is used for painting all kinds of surfaces by spraying for which purpose the company has developed many novel devices. It is claimed that the company's system does away with the slow, handbrushing method of painting and that a better quality of finish is produced. It is also pointed out that an intricately carved piece of work can be painted in approximately the same time required to finish a flat panel. The catalog is well illustrated and complete descriptions of each article are included.

Low Visibility Paint

The Joseph Dixon Crucible Co., Jersey City, N. J., has recently placed a low visibility paint on the market which is said to render the hulls of vessels practically invisible at a distance. It is reported that at the naval battle off the coast of Jutland, many German war ships succeeded in getting safely away from the combined British fleet, owing to the fact that their hulls and upper works were painted a dirty gray. Thus, it is seen, that low visibility paint plays

an important part in modern warfare. It is claimed that the Dixon company's product resists dampness, brine attack, etc., and that it is successfully used on smoke stacks, boiler fronts, hatch covers and coamings, winches and for various other purposes aboard ship.

Forging Presses

The United Engineering & Foundry Co., Pittsburgh, has issued a 48-page booklet describing a line of high-speed, steam-hydraulic forging presses. The presses are built in a range of sizes from 150 to 12,000 tons capacity for all kinds of pressing, forging and shearing. The booklet is well illustrated and descriptions of each type of press are included. Some interesting illustrations of actual forgings are also presented. They are fully dimensioned and the forging time for each piece is given. Tables giving the standard dimensions of the company's presses and a table of steam pressures in pounds per square inch are also included.

Valve Specialties

Stop check valves and pump regulating valves for marine use are described in an attractive booklet recently issued by the Thomas P. Ford Co., New York. The booklet gives complete descriptions of the company's products many of which are illustrated in sectional drawings. The Ford company began making valves in 1892. Among the products described is an automatic return check and stop valve for use between boiler and header; a screw-down stop and check valve for bilge drainage system; a stop check valve for use in boiler feed lines; and a pump regulating valve for steam pumps on shipboard supplying hydraulic pressure from 10 pounds up to 300 pounds.

Issues House Organ

The Dry Dock Dial is the title of an attractive house paper issued by the Morse Dry Dock & Repair Co., Brooklyn, N. Y. The paper, as outlined in its columns, is devoted to the welfare of the employees' association and to the interest of the firm. *The Dial* is published monthly. Bert Edward Barnes is the editor.

Equipment Used Afloat and Ashore

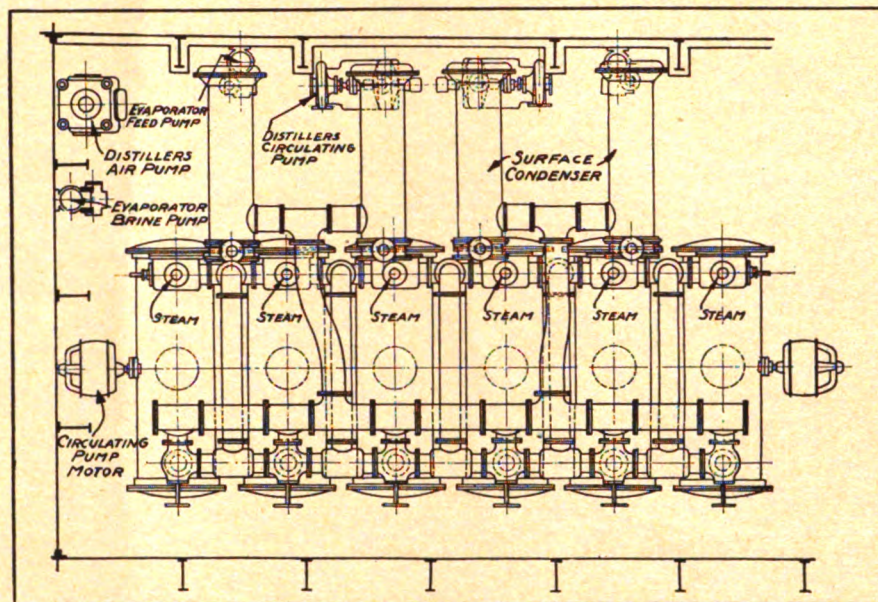
Lubricator for Stern Bushings—Distilling Apparatus—Pneumatic Calker—Plank Screw

FOR many years the tail shafts of steam vessels have been lubricated with sea water which was allowed to enter through grooves in the lignum vitae bushing. When the tail shaft had two liners, this practice often resulted in serious galvanic corrosion which commenced at the ends of the liners and would gradually eat its way into the shaft until there was a positive nick to the extent of over half an inch deep.

Another trouble connected with the usual open ended stern tube is the opportunity for the entry of sand and grit into the stern bushing. This sand accompanied by water has marked abrasive qualities which soon wears the shaft materially. It is well known that a badly worn stern bushing produces excessive vibration throughout a ship and also the usual thumping noise heard when the engines are reversed from ahead to astern or *vice versa*.

To overcome these problems and to provide means for properly lubricating the tail shaft, the device shown in the accompanying illustration is being handled by the McNab Co., Bridgeport, Conn. It consists of a white-metal or lignum vitae bushing over the tail shaft which fits the stern tube. Outside the hull, just back of the propeller boss, are fitted three glands. Two of these carry metallic packing rings while the one nearest the propeller carries a felt washer and a rubber composition washer. The rubber composition washer is designed to rotate with the shaft. The packing rings and felt washers come in contact with the propeller shaft shield.

Oil is supplied to the stern tube by means of piping from a convenient reservoir. A lubricator with a pump attachment is also provided to force oil into the stern tube should occasion



UNUSUALLY DESIGNED EVAPORATOR WITH FOUR CONDENSERS, EMPLOYED FOR DISTILLING SEA WATER

require. The device is said to give the shaft ample lubrication at all times as the oil can be permitted to run continuously, at any speed desired.

This method of oil lubrication has been employed on the British ferry steamer *STORETON* running between Liverpool and Rock Ferry. This vessel is running continually in sandy water and her work is quite severe. Her engines are reversed 34 times every 15 minutes and she runs 7½ hours a day. She was fitted with the appliance placed in commission in March, 1910. Her shafts were first drawn in 1913 and they have been recently drawn for the second time, when it was found that after more than six years continuous service in the sandy waters of the Mersey river, the bushings and shaft showed practically no wear.

The manufacturers of this device state

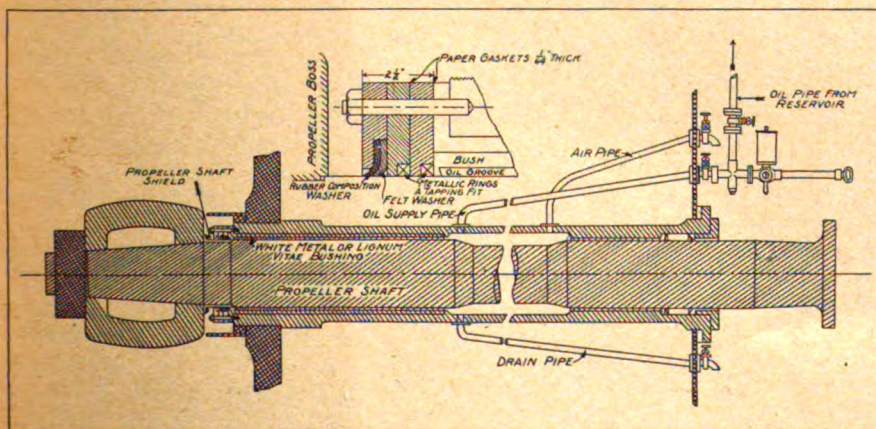
that oil lubrication has similar advantages on twin-screw brackets as on stern tubes. With oil lubrication, it is said, any kind of bushing may be used on the tail shaft. Lignum vitae lasts longer when oil is used but gun metal brass or white metal bushings are suitable, while cast-iron bushings have been often used with good results.

The device has been installed on several of the Great Lakes ships taken over by the government and transferred to salt water.

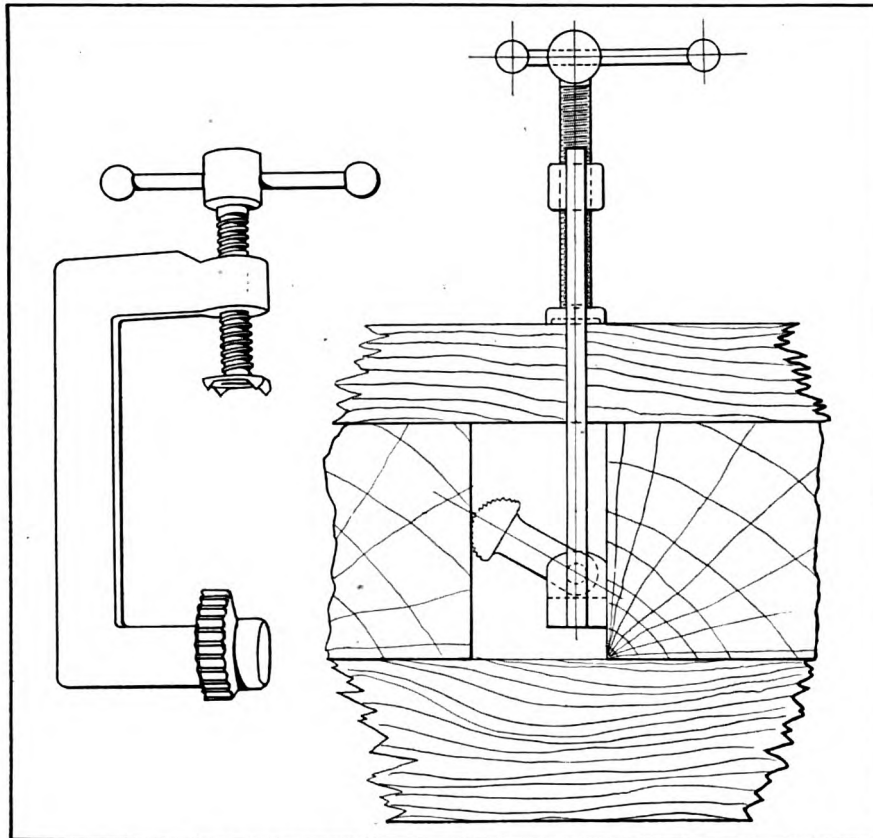
New Type of Evaporator

Those who are interested in the distilling of sea or other water or with evaporation problems will be interested in the evaporator shown in the accompanying illustration. It was built by the Wheeler Condensing & Engineering Co., Carteret, N. J., and is a modification of the sextuple effect sea water distilling apparatus previously manufactured by that company. Two of these evaporators now under construction are to be operated by steam up to 60 pounds per square inch gage pressure, or at any lower pressure.

Four condensers situated side by side are employed. It is said that this arrangement permits seven different combinations of operation to be employed. These are: Operation by one or more single effects; operation by one or more double effects with vapors reversible in each; operation by triple effect, or as two triple



STERN TUBE LUBRICATING DEVICE



PLANK SCREW FOR WOODEN SHIPBUILDING

effects with vapor reversible in each; operation by grouping as one quadruple and one single effect; operation as one vapor reversible quadruple effect with both end effects or either end pair of the section cut out; operation as a vapor reversible quintuple effect with one effect cut out; and operation as a vapor reversible sextuple effect.

Pneumatic Calking Device

The pneumatic calking machine shown in the accompanying illustration weighs 13½ pounds. It is said that the machine can be easily handled and worked in any position. It is designed automatically to tack either machine or hand-spun oakum in side, deck or bottom seams to any depth required for final horsing. On deck planking, it is said, the machine will do the horsing. The working speed is about 1500 tacks per minute, either coiling or running the oakum straight.

The device is controlled by a trigger similar to that on a light scaling hammer. The arrangement differs, however, from the usual hammer in that the piston has an extended rod fitted with a thin calking blade. This is a reciprocating iron with a positive back pull. The calking iron travels in guides which prevent it from turning. The device is fitted with springs so that the workman can vary the penetration of the calking iron with the varying

depth of the seam. A special device automatically feeds the oakum with each movement of the calking blade. Guide wheels running in the seam that is being calked keep the threading iron in alignment.

It is said that the tool operates with but little vibration and that an ordinary workman can operate it efficiently. The device is 22 inches long. The ordinary equipment consists of a calking

iron ⅝-inch thick, but a ⅜-inch iron can be used. The tool has been developed by the Ingersoll-Rand Co., New York.

Outside Planking Screw

In wooden shipyards the problem of holding the outside planking while it is being fastened to the frames, has to be given careful attention. To simplify this work, the outside planking screw shown in the accompanying illustration has been designed. The device is said to be simple and positive in its action. It consists of a frame with a machine-cut screw at one end and a swivel dog at the other end. These dogs are made in any length desired and are interchangeable. As the illustration shows, when the screw is tightened, the dog wedges the clamp firmly between two of the ship's timbers while the screw is free to force the plank in place. The device is being handled by the James Walker Co., Baltimore.

The Hartmann-Bodilly-Suess Co., Green Bay, Wis., has succeeded to the business of the Hartmann-Greiling Co., machinery exchange, and also the Nelson machinery exchange and machine shop. The company will handle marine repairs. The officers of the new company are: Carl Hartmann, president; John W. Bodilly, vice president; Paul F. Suess, secretary and treasurer.

Henry Ford's submarine chasers will be known in the navy as "Eagles" and will constitute the eagle class of boats, it was announced recently by the navy department.



PNEUMATIC AND HAND CALKING COMPARED